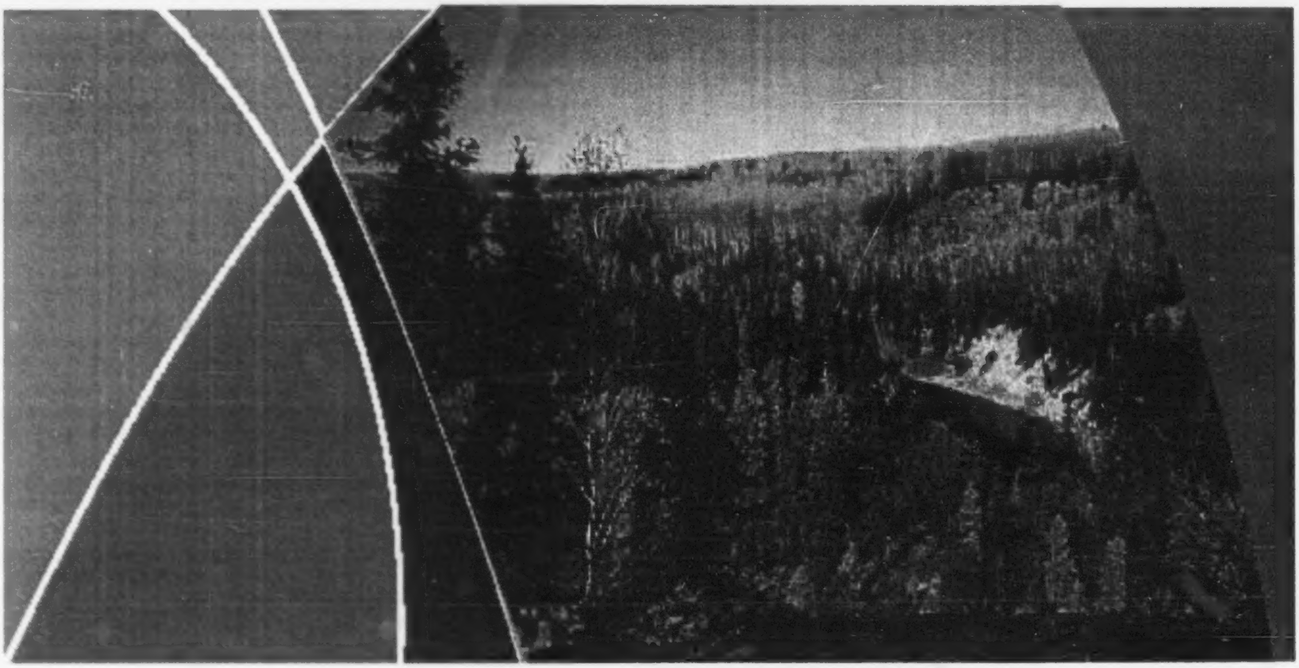
ERCB Decision 2011-005, January 27, 2011
CEAA Reference No. 08-05-37519

Report of the Joint Review Panel

Joslyn North Mine Project
TOTAL E&P Joslyn Ltd.
Alberta



Joint Review Panel Established by the Federal Minister of the Environment
and the Energy Resources Conservation Board

REPORT OF THE JOINT REVIEW PANEL ESTABLISHED BY
THE FEDERAL MINISTER OF THE ENVIRONMENT AND THE
ENERGY RESOURCES CONSERVATION BOARD
Decision 2011-005: Total E&P Joslyn Ltd., Application for the Joslyn North Mine Project

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JOSLYN NORTH MINE PROJECT JOINT REVIEW PANEL
Calgary Alberta

TOTAL E&P JOSLYN LTD.
APPLICATION FOR AN OIL SANDS MINE AND
BITUMEN PROCESSING FACILITY
JOSLYN NORTH MINE PROJECT
FORT MCMURRAY AREA

Decision 2011-005
Application No. 1445535

1 SUMMARY, DECISION, AND RECOMMENDATIONS

In February 2006, TOTAL E&P Joslyn Ltd. [1] (TOTAL) applied to the Energy Resources Conservation Board[2] (ERCB),[3] pursuant to Sections 10 and 11 of the *Oil Sands Conservation Act* and Sections 3, 24, and 26 of the *Oil Sands Conservation Regulation*, and to Alberta Environment (AENV), pursuant to the *Environmental Protection and Enhancement Act* and the *Water Act*, for the construction, operation, and reclamation of the Joslyn North Mine Project (the project).

The project is to be located about 70 kilometres north of Fort McMurray. It consists of an oil sands surface mine and ore preparation and bitumen extraction facilities. It is designed to produce about 16 000 cubic metres per day of liquid hydrocarbon. The project also includes tailings management facilities and other supporting infrastructure. The ERCB deemed the application technically complete in January 2008, and AENV determined that the environmental impact assessment was complete in February 2008.

On August 8, 2008, the federal Minister of the Environment and the chairman of the ERCB signed the Agreement to Establish a Joint Review Panel for the project (Appendix 2), putting in place a three-member panel to review the proposed project which will be referred to throughout this report as the Panel.

The Panel considered the application at a public hearing in Fort McMurray, Alberta, that began on September 21, 2010 and concluded in Sherwood Park, Alberta on October 8, 2010.

Having regard for its responsibilities under the *Energy Resources Conservation Act*, the *Canadian Environmental Assessment Act*, and the *Oil Sands Conservation Act*, the Panel has carefully considered all of the evidence pertaining to the applications of TOTAL. The Panel finds that the project is in the public interest for the reasons set out in the report. Under its authority as the ERCB, the Panel is prepared to approve Application No. 1445535, subject to the conditions in Appendix 3 and subject to the approval of the Lieutenant Governor in Council.

The Panel also expects that TOTAL will adhere to all of the commitments it made during the consultation process, in the application, and at the hearing to the extent that those commitments do not conflict with the terms of the approval or licence affecting the project or any law, regulation, or similar requirement that TOTAL is bound to observe. TOTAL's commitments are listed in Appendix 5.

---

[1] Formerly Deer Creek Energy Limited.
[2] Formerly the Alberta Energy and Utilities Board (EUB).
[3] See Appendix 1 for the list of acronyms and abbreviations used in this report.

With regard to its responsibilities under the *Canadian Environmental Assessment Act* and its terms of reference, the Panel assessed the environmental effects of the project and their significance, including those caused by possible accidents and malfunctions, and the cumulative environmental effects that the project could cause when combined with the effects from other works, projects, or activities, taking into account measures that TOTAL proposed to mitigate these effects. The Panel also considered the purpose and need for the project, the feasible alternatives, the need for a follow-up program, and the capacity of renewable resources to meet the needs of current and future generations. The Panel concludes that the project, meeting the conditions and recommendations (Appendix 4) imposed, would:

- meet the stringent new requirements for tailings management of the ERCB's *Directive 074: Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes*,
- have no net significant adverse effect on species at risk,
- have no significant adverse effect on valued wildlife species, and
- have no significant adverse environmental effect on water quality.

In addition, the Panel finds that TOTAL has:

- obtained the withdrawal of objections concerning the project from the Fort McKay First Nation and Métis Local #63, the Athabasca Chipewyan First Nation, the Mikisew Cree First Nation, and the Regional Municipality of Wood Buffalo by having entered into agreements with them, and
- committed to project and collective research toward making end pit lakes part of self sustaining ecosystems.

Accordingly, the Panel finds that the project is in the public interest.

2 INTRODUCTION

2.1 Background

In February 2006, TOTAL applied to the ERCB, pursuant to Sections 10 and 11 of the *Oil Sands Conservation Act* and Sections 3, 24, and 26 of the *Oil Sands Conservation Regulation*, and to AENV, pursuant to the *Environmental Protection and Enhancement Act* and the *Water Act*, for the construction, operation, and reclamation of an oil sands surface mine and bitumen extraction facility to be located about 70 kilometres north of Fort McMurray. The ERCB deemed the application technically complete in January 2008 and AENV determined that the environmental assessment report was complete in February 2008.

The proposed project was subject to an environmental assessment under the *Canadian Environmental Assessment Act* since components of the project required authorization, pursuant to Section 35(2) of the *Fisheries Act*, to consider any harmful alteration, disruption, or destruction of fish habitat. Fisheries and Oceans Canada (DFO), as the authority responsible for this environmental assessment, was required to undertake this environmental assessment under the *Canadian Environmental Assessment Act*. On March 17, 2008, the Minister of Fisheries and Oceans recommended that the project be referred to a review panel. On April 28, 2008, the federal Minister of the Environment referred the project to a panel review.

2.2 Joint Review Process

Consistent with the Canada-Alberta Agreement for Environmental Assessment Cooperation (2005), the Canadian Environmental Assessment Agency and the ERCB agreed to establish a joint review panel agreement. On April 28, 2008, the Canadian Environmental Assessment Agency invited public comment on a draft joint review panel agreement. On August 8, 2008, after taking the comments received into consideration, the federal Minister of the Environment and the chairman of the ERCB signed the Agreement to Establish a Joint Panel for the Joslyn North Mine Project (Appendix 2), which set up a three-member panel to review the proposed project.

Mr. J. D. Dilay was appointed as the panel chair and Mr. J. Ebbels and Dr. W. Ross were appointed as panel members. Mr. Ebbels passed away in February 2010 and was replaced by Mr. D. McFadyen.

The agreement stated that the Panel shall conduct its review in a manner that discharges the responsibilities of the ERCB under the *Energy and Utilities Board Act* and the *Energy Resources Conservation Act*, and according to the requirements set out in the *Canadian Environmental Assessment Act* and in the terms of reference for the Panel. The agreement described the terms, conditions, and process to be followed by the Panel when conducting the joint review. The panel's terms of reference also described the scope of the environmental assessment. Table 1 summarizes the key steps of the review process and the associated timelines.

In August and September 2008, the Panel reviewed the information available on the Canadian Environmental Assessment Registry and determined that the information provided was not sufficient to proceed to a hearing. In September 2008, the Panel requested additional information from TOTAL.

Subsequently, TOTAL decided to revise the project and update its environmental assessment. TOTAL filed its revised project, updated environmental assessment, and response to the Panel's request in February 2010, about 1½ years after the Panel's request for additional information.

Table 1. A timeline of the key steps in the review process

Date	*Process Step*
August 8, 2008	Panel was appointed
August 8 to September 18, 2008	Panel reviewed the information available
September 18, 2008	Panel requested additional information from TOTAL
TOTAL undertook an update to its project and worked on response to additional information requests for a period of some 1.5 years.	
February 25, 2010	TOTAL submitted its response to additional information requests and a project update
March 16 to May 17, 2010	Panel invited comments from interested parties on TOTAL's information filed on February 25, 2010
June 21, 2010	Panel requested additional information from TOTAL
June 25, 2010	Panel announced public hearing to commence on September 21, 2010
July 27, 2010	TOTAL provided its response to additional information requested
August 24, 2010	TOTAL provided its response to additional information requests regarding species at risk
August 24, 2010	Interveners filed their submissions for the hearing
September 7, 2010	Interveners filed their submissions regarding species at risk
September 7, 2010	TOTAL responded to intervener submissions
September 14, 2010	TOTAL responded to intervener submissions on species at risk
September 21, 2010 – October 8, 2010	Public hearing
November 8, 2010	Submission of final undertaking (formal closing of the record of the proceeding)

Following the Panel's review of the 2010 Additional Information—Project Update and the written comments received on the update, the Panel informed TOTAL that it required additional information, minor in nature, before proceeding to a hearing. The Panel asked if TOTAL could commit to provide the information by July 27, 2010. TOTAL committed to provide most of the information by July 27, 2010, and it committed to provide information pertaining to federal species at risk[4] by the end of August 2010. Based on this commitment, the Panel announced on June 25, 2010 that the public hearing would commence on September 21, 2010.

The Panel commenced the hearing on September 21, 2010 and adjourned it the same day to deliberate on a number of preliminary matters; in particular, questions of constitutional law (Section 2.5). The Panel made its decisions on these matters on September 22, 2010.

The Panel reconvened the public hearing on September 28, 2010. The hearing ended on October 8, 2010. Undertakings requested by the Panel during the hearing were completed on November 8, 2010. Accordingly, the Panel considers that November 8, 2010, was the close of the record of the proceeding. The Panel made hearing transcripts and all documents related to the proceeding available on the public registry established for the project.

2.3 Participant Funding Program

The Canadian Environmental Assessment Agency awarded $100 000 amongst the following five applicants[5] to assist in their review of the environmental impact assessment and their participation in the public hearing:

• Sierra Club Canada	$20 000
• The Pembina Institute (one of the groups constituting the Oil Sands Environmental Coalition)	$41 000
• The Clearwater River Paul Cree Band[6]	$13 000
• The Non-Status Fort McMurray Band Descendants	$13 000
• The Off-Reserve Fort McMurray Band	$13 000

The Canadian Environmental Assessment Agency awarded $340 840 amongst the following applicants[7] to assist aboriginal groups who planned to consult with the federal government and participate in the public hearing:

• Athabasca Chipewyan First Nation	$87 700
• Meadow Lake Tribal Council	$20 000
• Mikisew Cree First Nation	$71 300
• Prince Albert Grand Council	$50 000
• Fort McMurray First Nation Industrial Relations Corporation	$58 700
• Chipewyan Prairie Dene First Nation	$53 140

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[4] In this report species at risk refers to any species listed on any Schedule of the federal *Species at Risk Act* and any species listed as "sensitive", "at risk", or "may be at risk" in the *General Status of Alberta Wild Species 2005*.

[5] Money awarded does not necessarily equate to money disbursed (e.g., if a group did not participate in the hearing).

[6] Also known as the Clearwater River Band No. 175

[7] Money awarded does not necessarily equate to money disbursed (e.g., if a group did not participate in the hearing).

2.4 Purpose of This Report

This report presents the results of the Panel's review of TOTAL's proposed project. It includes the Panel's conclusions and recommendations, pursuant to the *Canadian Environmental Assessment Act*, and the Panel's decision on Application No. 1445535 before the ERCB. The Panel understands that DFO, as the responsible authority, will lead the federal government response to this report. The Panel also understands that AENV will continue to process the *Environmental Protection and Enhancement Act* and *Water Act* applications associated with this project.

The Panel is satisfied that it has complied with its terms of reference and that it has gathered enough information to draw conclusions and make recommendations on the matters set out in this report and to make its decision.

2.5 Questions of Constitutional Law

Part 2 of the *Administrative Procedures and Jurisdiction Act* states that a decision maker does not have jurisdiction to determine a question of constitutional law unless it is designated under the Act as having authority to decide the question. Pursuant to the *Authorities Designation Regulation*, Alta. Reg. 64/2003, the ERCB is a designated decision maker with authority to decide any question of constitutional law.

In August and September 2010, the Panel received notices of questions of constitutional law from the following groups: Athabasca Chipewyan First Nation (ACFN), the Fort McKay First Nation and Métis Nation Local #63 (Fort McKay), the Mikisew Cree First Nation (MCFN), and the Non-status Fort McMurray Band Descendants, Off-Reserve Fort McMurray Band, and the Clearwater River Band (collectively, in a single notice). In a letter dated September 9, 2010, the Panel invited interested parties to provide written comments on any matters that might bear on the Panel's jurisdiction over the questions presented in the notices. The Panel stated that it was particularly interested in submissions on

- the adequacy of any notice (i.e., whether each of the notices complied with Section 12 of the *Administrative Procedures and Jurisdiction Act*);
- the extent of the Panel's jurisdiction to decide on issues raised in the notices;
- whether the Panel should or must make a decision at the outset of the hearing on the question of the adequacy of aboriginal consultation, which was one of the questions raised in a number of the notices; and
- whether the Court of Queen's Bench of Alberta was a more appropriate forum to decide on one or more of the questions raised in the notices, in accordance with Section 13 of the *Administrative Procedures and Jurisdiction Act*.

After receiving comments from interested parties, the Panel allowed each of the parties that filed a notice of question of constitutional law to provide a written response to the comments. On September 17, 2010, the Panel issued a letter stating that it had determined that the notice of question of constitutional law filed by the Non-status Fort McMurray Band Descendants, *et al.*, did not comply with the notice requirements of the *Administrative Procedures and Jurisdiction Act*; therefore, the Panel did not have jurisdiction to decide the constitutional questions raised in the notice filed by those parties. The Panel also stated that it intended to open the hearing on September 21 to hear submissions relating to the three remaining notices of questions of constitutional law.

In a letter dated September 20, 2010, from its counsel, Fort McKay stated that it had reached an arrangement with TOTAL and removed its objection to the application and withdrew its notice of question of constitutional law. When the hearing opened on September 21, 2010, ACFN's counsel advised the Panel that it was withdrawing its notice of question of constitutional law. In a subsequent letter dated September 24, 2010, from its counsel ACFN stated that it intended to address its concerns with the project through discussions with TOTAL, rather than addressing those concerns through the hearing process. As a result, only the notice of question of constitutional law that was filed by MCFN was addressed in the oral submissions made on September 21, 2010. The Panel heard submissions from a number of parties on the Panel's authority to consider the questions raised in MCFN's notice, including submissions from the Government of Alberta whose participation in the hearing was limited to addressing matters arising from the notices of questions of constitutional law.

The Panel also heard argument on a motion by the Oil Sands Environmental Coalition (OSEC) asking the Panel to direct TOTAL to perform an analysis of cumulative effects and a motion by TOTAL asking the Panel to require MCFN to provide better responses to TOTAL's information requests.

In a letter dated September 22, 2010, from its counsel, MCFN advised the Panel that it had reached an agreement with TOTAL with respect to the application. As part of the agreement, MCFN formally withdrew both its objection to the application and its notice of question of constitutional law. On September 22, 2010, the Panel issued a letter (Appendix 6) advising that no questions of constitutional law remained in the proceeding for the Panel to consider.

2.6 Project Setting and Description

The proposed project would be located about 70 kilometres north of Fort McMurray in

- Township 94, Ranges 11-12, West of the 4th Meridian;
- Township 95, Ranges 11-13, West of the 4th Meridian; and
- Township 96, Ranges 11-13, West of the 4th Meridian.

The project would be located on TOTAL's Joslyn lease, where there are oil sands resources to support mining activities from 2017 to 2037. See Figure 1 for the project location and Figure 2 for the project layout.

TOTAL estimated the capital cost of the project to be $7 to $9 billion. It proposed the following timeline for the proposed project:

- Design Basis Memorandum—late 2009
- basic engineering—early 2011

- regulatory approvals—fourth quarter of 2011
- initial site drainage—fourth quarter of 2011
- Joslyn Creek realignment—between 2012 and 2014
- detailed engineering, procurement, and construction—from the third quarter of 2011 to the third quarter of 2016
- commissioning and start-up—fourth quarter of 2016
- initial operation and ramp-up—2017

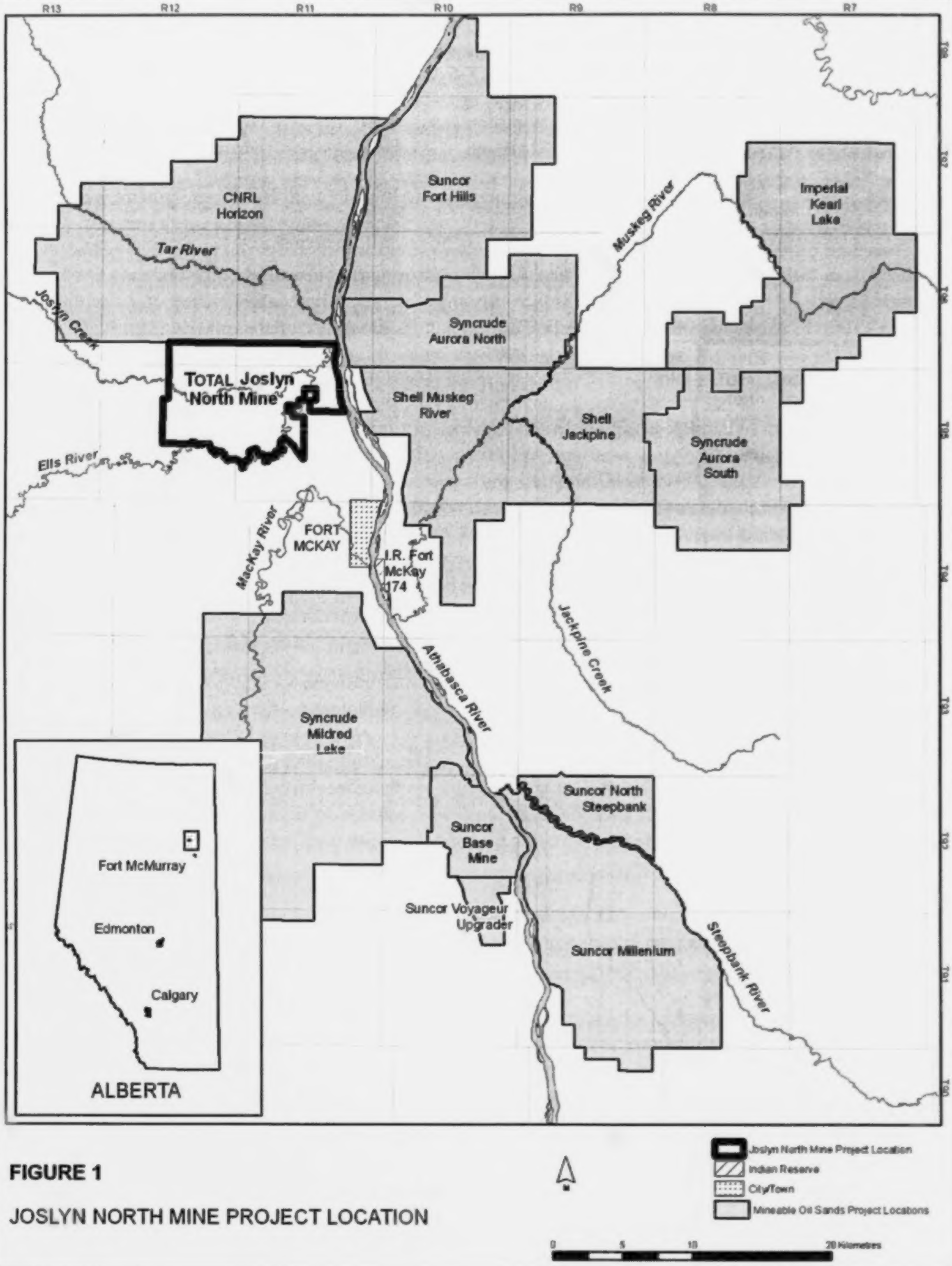
The project includes the design, construction, and operation of the following:

- truck and shovel mining technology for the development of one mine pit to support a production rate of about 16 000 cubic metres per day (100 000 barrels per day) of partially deasphalted bitumen product;
- a Tier IV compliant haul truck fleet at the start of production;
- ore crushing and conveying facilities, slurry preparation equipment that reprocesses rejected material, and three hydrotransport slurry lines;
- two bitumen froth production trains with individual capacities of 4300 tonnes per stream hour that incorporate primary separation cells, middlings stream flotations cells, hydrocyclones, and a deaeration unit;
- two paraffinic solvent-containing froth treatment trains, each operating at a maximum capacity of about 10 000 cubic metres per day (65 000 barrels per day). The froth treatment plant includes a two-stage countercurrent froth-settling circuit, a two-stage tailings solvent recovery circuit, and a solvent recovery unit;
- a coarse tailings pumping system, in-plant tailings thickeners, and centrifuges for fluid fine tailings treatment;
- three sand beach areas for placement of coarse tailings, two dedicated disposal areas for thickened tailings, two ponds for froth treatment tailings, and a pond for recycle water;
- on-site energy generation infrastructure to generate electricity and steam;
- systems to treat and recycle of water;
- potable water and sanitary sewage systems;
- water infrastructure, including a bank river-water intake system on the Athabasca River and a 90 day off-stream storage pond;
- storage facilities for bitumen froth, diluted bitumen, and solvent, and an emergency dump pond;

- roads and crossings, including a haul road underpass beneath the Canadian Natural Resources Limited (CNRL) road and associated utility corridors for powerlines, natural gas, tailings, and recycle water transport lines;
- on-site infrastructure, including maintenance shops, administration buildings, engineering and operations buildings, and the project camp;
- material storage facilities, including external disposal areas for overburden and interburden, reclamation material stockpiles, a landfill suitable for class II and III water material, and a transfer site for temporary storage of hazardous materials; and
- a Joslyn Creek realignment and compensation lake.

The project also includes plans for

- management of all waste products;
- closure, conservation, and reclamation activities for the first 10-year period of mine development, as well as every five years thereafter until closure;
- tailings management;
- water management;
- construction activities;
- environment, health, and safety management for the project, including greenhouse gas emissions; and
- agreements with stakeholders.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R12
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T98
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T95
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T92
T91
T90
CNRL Horizon
Suncor Fort Hills
Imperial Kearl Lake
Muskeg River
Tar River
Joslyn Creek
Syncrude Aurora North
TOTAL Joslyn North Mine
Shell Muskeg River
Shell Jackpine
Syncrude Aurora South
Ells River
MacKay River
FORT MCKAY
I.R. Fort McKay 174
Jackpine Creek
Athabasca River
Syncrude Mildred Lake
Suncor North Steepbank
Suncor Base Mine
Suncor Voyageur Upgrader
Suncor Millenium
Steepbank River
Fort McMurray
Edmonton
Calgary
ALBERTA
Joslyn North Mine Project Location
Indian Reserve
City/Town
Mineable Oil Sands Project Locations
0
5
10
20 Kilometres

FIGURE 1

JOSLYN NORTH MINE PROJECT LOCATION

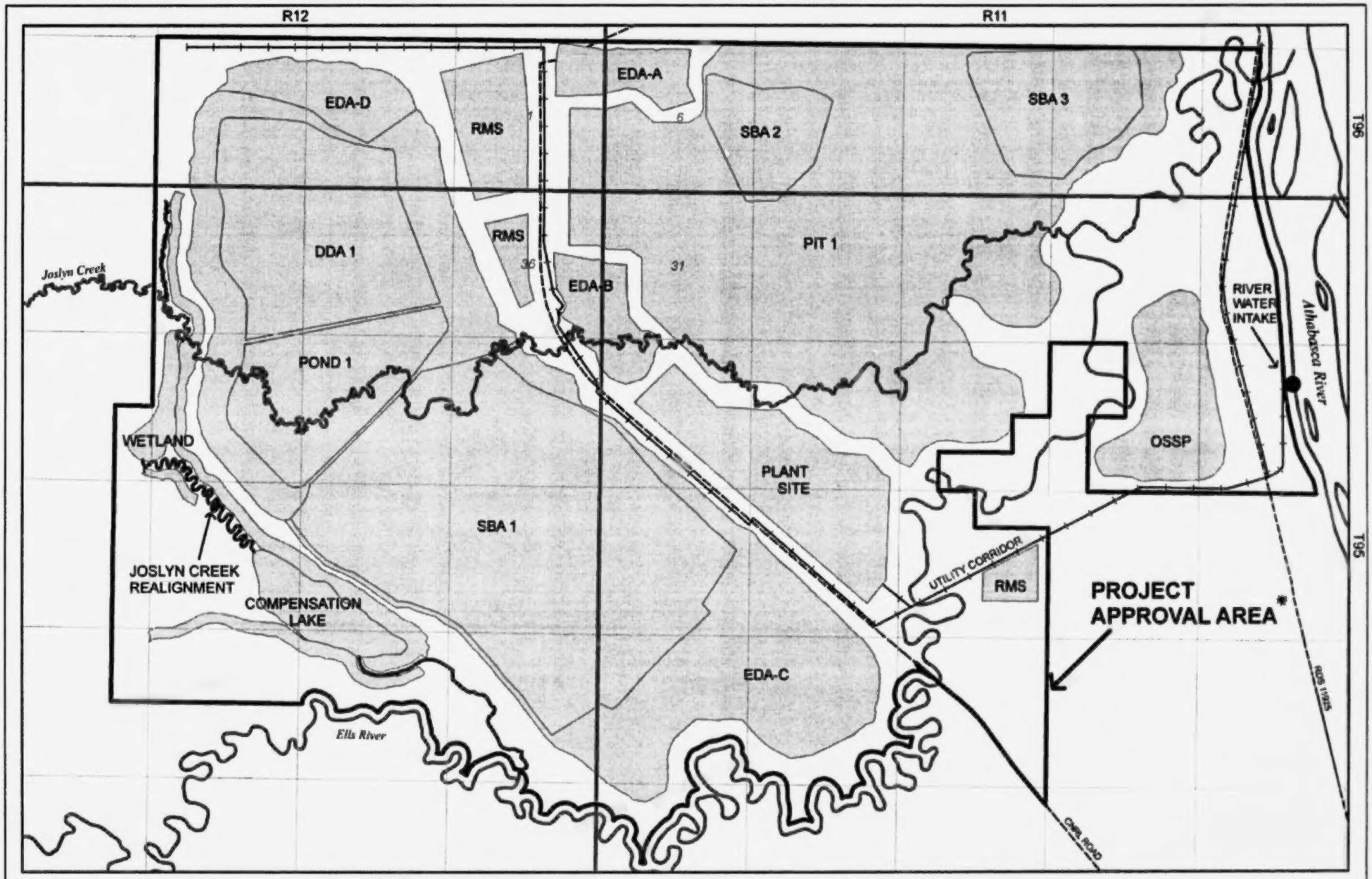
R12
R11
T96
T95
EDA-D
RMS
EDA-A
SBA 2
SBA 3
6
1
DDA 1
RMS
PIT 1
36
31
EDA-B
Joslyn Creek
POND 1
RIVER WATER INTAKE
Athabasca River
WETLAND
OSSP
PLANT SITE
SBA 1
JOSLYN CREEK REALIGNMENT
COMPENSATION LAKE
UTILITY CORRIDOR
RMS
PROJECT APPROVAL AREA*
EDA-C
Ells River
CNRL ROAD

FIGURE 2

JOSLYN NORTH MINE PROJECT LAYOUT

N
0 0.5 1 2 Kilometres

DDA	Dedicated Disposal Area
EDA	External Disposal Area
OSSP	Off Stream Storage Pond
RMS	Reclamation Material Stockpile
SBA	Sand Beach Area

* Approval area setbacks from the Ells River and Athabasca River are subject to adjustments as discussed in the recommendations outlined in this report.

2.7 Involvement of Interested Parties

Industrial Parties

Shell Canada Ltd., BP Canada Energy Company, and Syncrude Canada Ltd. attended the hearing to monitor the proceedings. These companies did not object to the project.

CNRL operates the Horizon Mine and processing plant directly north of the proposed Joslyn North Mine Project. CNRL did not provide a submission to, or register for, the hearing but it did provide some comments on the revised project application to note that it planned to work cooperatively with TOTAL to address its concerns.

Joslyn Energy Development did not attend the hearing but provided a letter indicating that it supported the project. It shares a common lease boundary with TOTAL's project and is working cooperatively with TOTAL.

The Fort McMurray Construction Association and the Building Trades of Alberta provided letters of support for the project. These groups did not attend the hearing.

Regional Municipality of Wood Buffalo

The Regional Municipality of Wood Buffalo (RMWB) originally objected to the project but withdrew its objection as a result of coming to an agreement with TOTAL.

The RMWB provided a written submission to the hearing and participated in the hearing. It provided a panel of witnesses to speak to its submission, which focused on socioeconomic impacts. It cross-examined TOTAL and made final arguments.

Fort McMurray Chamber of Commerce

The Fort McMurray Chamber of Commerce filed a written submission in support of the application. It referenced increased government funding in the last few years which resulted in improvements to the socioeconomic conditions within the RMWB. It did not appear at the hearing.

Oil Sands Environmental Coalition

The Oil Sands Environmental Coalition (OSEC), made up of the Pembina Institute, the Fort McMurray Environmental Association, and the Toxics Watch Society of Alberta provided a written submission and attended the hearing. It noted its concerns about the adequacy of the environmental assessment conducted by TOTAL. OSEC also provided comments on the project's contribution to greenhouse gases, the adequacy and costs of reclamation, and the methodologies used to determine effects on water quality. OSEC requested that the project be denied on the basis that it would not be in the public interest and that it would cause significant adverse effects.

Sierra Club Prairie

Sierra Club Prairie provided a written submission and participated in the hearing. Its concerns mainly focused on the need for a sustainability approach to assess the project, greenhouse gas emissions, and the adequacy of the cumulative effects assessment. Sierra Club Prairie requested that the project be denied on the basis that it is not in the public interest.

Environmental Defence

Environmental Defence provided a written submission consisting of reports related to tailings and air quality in the oil sands regions. It requested that the project be rejected. The Environmental Defence submission was supported by several organizations across Canada. Environmental Defence did not appear at the hearing.

Mikisew Cree First Nation

MCFN originally objected to the project but withdrew its objection when it signed an agreement with TOTAL. It remained concerned about the cumulative effects of oil sands projects on its members' treaty rights.

MCFN provided a written submission to the Panel. The submission described MCFN's concerns about how its traditional territory and rights have been and would be affected by oil sands developments. MCFN submitted traditional land use and traditional ecological knowledge studies, including interview summaries and maps depicting its current use of lands and resources. MCFN did not provide witnesses at the hearing to speak to its submission. It cross-examined the Government of Canada and provided closing arguments.

Fort McKay First Nation and Métis Nation Local #63

Fort McKay originally objected to the project but withdrew its objection when it signed an agreement with TOTAL. Fort McKay remained concerned about the pace, scale, and magnitude of the cumulative impacts of oil sands projects on its community, rights, and culture.

Fort McKay provided a written submission to the Panel. It included information on its current use of lands and resources for traditional purposes and depicted its traditional territory showing ecosystems deemed culturally significant near the project area. It suggested approval conditions and recommendations pertaining to noise, air quality and odours, safety, groundwater, surface water, wildlife, and reclamation. Fort McKay did not provide any witnesses at the hearing but cross-examined the Government of Canada and provided closing arguments.

Athabasca Chipewyan First Nation

ACFN originally objected to the project but withdrew its objection when it signed an agreement with TOTAL. It remained concerned about the cumulative effects of oil sands projects on its members' treaty rights.

ACFN provided a written submission to the Panel. The submission described the ACFN's concerns about the project's cumulative impacts on its aboriginal and treaty rights, and its effects on water quality and quantity and on species at risk. This group did not provide any witnesses at the hearing but cross-examined the Government of Canada and provided closing arguments.

Non-Status Fort McMurray Band Descendants, Off-Reserve Fort McMurray Band Descendants, and Clearwater River Band No. 175

The Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175 raised a number of concerns at the hearing. They provided a panel of witnesses and cross-examined TOTAL and other interveners and provided closing arguments. Their concerns focused on the project's effects and cumulative effects on wildlife, wildlife habitat, water quality and quantity, air quality, country foods, sacred sites, and socioeconomic issues. They also indicated concerns about being recognized as aboriginal people with rights. They stated that they objected to the project.

The Off-Reserve Fort McMurray Band Descendants initially worked together with the Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175. The Off-Reserve Fort McMurray Band Descendants withdrew its statement of concern prior to the hearing, as it was going to work directly with TOTAL.

Other Interested Parties

Mr. Harvey Scannie and Mrs. Nancy Scannie provided their comments orally to the Panel at the hearing without providing written submissions or closing arguments. Mr. Scannie discussed the history of aboriginal people. He mentioned the UN Declaration on the Rights of Indigenous Peoples. He recommended that TOTAL invest in cultural retention programming. Mrs. Scannie spoke about when she lived and hunted and gathered in the area. She commented on socioeconomic issues, including housing issues. She expressed concerns about pollution and the loss of wildlife, fish, and vegetation resulting from oil sands projects.

Mr. Mike Guertin is a local trapper who lives on the Athabasca River and was a holder of a Registered Fur Management Licence for Registered Fur Management Area No. 1570. He noted his trapline was about 100 kilometres from the project. He also noted that he was the owner of an ecotourism business, Wood Buffalo Wilderness Tours Ltd., which includes tours departing from Fort McKay heading downstream on the Athabasca River. He did not provide a written submission but provided his comments orally to the Panel at the hearing. He also cross-examined TOTAL and other interveners, and he provided closing arguments. Mr. Guertin provided his view on the lack of consultation conducted with him by TOTAL. He raised concerns about the cumulative effects of oil sands developments and how these impacts will affect his livelihood. He also noted concerns about the potential health effects of eating country foods on him and his family.

Mr. F. Belanger, a member of the Deninu Kue First Nation, appeared on the first day of the hearing. He did not provide a written submission or participate further in the hearing process. He raised concerns regarding the pace of oil sands development.

Government of Canada

Government of Canada representatives who participated in the environmental assessment process included: DFO, Environment Canada (EC), Parks Canada Agency, Health Canada (HC), and Natural Resources Canada (NRCan). The Government of Canada provided written submissions and participated at the hearing.

DFO stated that it was responsible for issuing an authorization under the *Fisheries Act*. DFO provided its views on the effects of the project on fish and fish habitat.

EC stated that its mandate covered the preservation and enhancement of the quality of the natural environment, including water, air, soil, flora, and fauna, including species at risk and migratory birds. EC provided comments on migratory birds and species at risk and the loss of habitat for these species, including the cumulative effects on wildlife habitat. It also provided comments on reclamation, air quality, and water quality issues.

Parks Canada Agency stated that it managed and administered Canada's national heritage protected areas network, which preserves the rich diversity of Canada's natural and cultural heritage. It provided comments about the potential cumulative environmental impacts of oil sands, hydroelectric projects, and overall industrial development on the Peace Athabasca Delta, part of which is located in Wood Buffalo National Park.

HC stated that its department was responsible for helping people of Canada maintain and improve their health. HC focused its review on the proponent's assessment of the potential health impacts of noise and of changes in air and drinking water quality and in country foods.

NRCan stated that its mandate was to promote the sustainable development and responsible use of Canada's mineral, energy, and forestry resources; to develop an understanding of Canada's landmass; and to collect and disseminate knowledge on sustainable resource development. NRCan's review focused on groundwater quality and quantity.

Government of Alberta

The Government of Alberta through AENV, Alberta Sustainable Resource Development (SRD), and Alberta Health and Wellness provided some written comments on the application. The Government of Alberta did not participate in the hearing other than to provide representation on the first day as it related to the Notice of Constitutional Questions raised by the various parties.

3 ISSUES

The Panel considers the issues respecting the application to be

- the need for the project, alternatives to, and alternative means of carrying out the project;
- the mine plan and resource conservation;
- environmental effects:
  - wildlife,
  - vegetation and wetlands,
  - water,
  - fish and fish habitat,
  - air quality,
  - historic and paleontological resources,
  - current use of lands and resources for traditional purposes by aboriginal persons, and
  - effects of potential accidents and malfunctions;
- cumulative environmental effects;
- sustainability of renewable resources;
- socioeconomic effects:
  - economic benefits,
  - public infrastructures and municipal services,
  - availability of housing and affordable housing,
  - health services,
  - human health,
  - noise, and
  - access management;
- reclamation;
- liability management; and

- the proposed end pit lake.

In reaching the determinations contained within this decision, the Panel has considered all relevant materials constituting the record of this proceeding, including the evidence and argument provided by each party. Accordingly, references in this decision to specific parts of the record are intended to help the reader understand the Panel's reasoning relating to a particular matter and should not be taken as an indication that the Panel did not consider all relevant portions of the record with respect to that matter.

The proceeding was somewhat unusual in that although ACFN, MCFN, and Fort McKay withdrew their opposition to the project, their submissions remained on the record. These parties did not provide any witnesses to speak to their submissions or allow for testing of their submissions through cross-examination by TOTAL, other interveners, or the Panel. As such, the Panel is unable to assign their submissions much weight. At the end of the hearing, during final argument, the ACFN, MCFN, and Fort McKay made several recommendations, which the Panel summarized in Appendix 7.

Similarly, the material submitted by Environmental Defence and the Government of Alberta was not supported by witnesses. Accordingly, the Panel is unable to give their material much weight.

4 NEED FOR THE PROJECT AND ALTERNATIVES CONSIDERED

4.1 Purpose of, Need for, and Alternatives to the Project

4.1.1 Views of TOTAL

In establishing the need for the project, TOTAL stated that conventional crude oil production opportunities were declining and that additional heavy oil production would be needed to compensate for this decline. TOTAL stated that oil sands development could and would play a central role in the future global and North American energy supply. It stated that although alternative energy was important, the technology was still in the early stages of development and alternative energy sources would be only a small contributor to the global energy supply matrix in the short and medium term. TOTAL stated that liquid fuels required for transportation were difficult to replace with alternative forms of energy and believed that liquid hydrocarbon fuels for transportation would be required for the foreseeable future.

TOTAL stated that production from the Athabasca Oil Sands region would contribute significantly to meeting Canadian and North American demand for liquid fuels, and that the proposed production of some 16 000 cubic metres per day (100 000 barrels per day) from the Joslyn North Mine Project is equal to about 10 per cent of the liquid hydrocarbon demand in Canada.

TOTAL stated that the development of the Joslyn North Mine Project and the other bitumen resources in the Athabasca Oil Sands region is an important opportunity for the Alberta and Canadian economies, and that oil sands development was an extremely important element of its long-term goals for Canadian operations.

4.1.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC expressed concerns regarding the carbon dioxide emissions associated with producing non-conventional hydrocarbon resources such as oil sands. OSEC stated that energy sources that produce less carbon are more desirable than those that emit more carbon and that it would be preferable if focus was placed on renewable energy or nuclear power, which do not produce carbon emissions. In addition, OSEC stated its belief that there would be future requirements to capture carbon emissions and that such requirements could negatively impact the economics of developing oil sands resources.

4.1.3 Panel Conclusions and Recommendations

The Panel recognizes that the purpose of the project is to recover and market the bitumen resources located on the Joslyn lease.

The Panel believes that demand for liquid hydrocarbon fuels will continue to be strong and that alternatives such as energy from renewable or nuclear sources will not replace liquid hydrocarbon fuels in the short to medium term. The Panel is also of the view that there is a need to replace conventional crude oil production to meet market demand.

The Panel concludes that the project would meet the purpose of recovering the bitumen on the Joslyn lease, and would help meet Canadian and global energy demands for fuel by producing about 16 000 cubic metres per day (100 000 barrels per day) of liquid hydrocarbon.

The Panel also recognizes that the project represents an economic opportunity for Alberta and Canada.

4.2 Alternative Means of Carrying Out the Project

4.2.1 Views of TOTAL

TOTAL stated that in the planning stages of the project, it assessed alternative means of recovering the bitumen resource from the Joslyn lease, and that for each project component, it considered reliability, operability, environmental effects, project and operating costs, resource conservation, and commercial readiness when determining the preferred means of carrying out the project.

TOTAL stated that it assessed extraction and tailings technology with the intent of meeting the ERCB's *Directive 074*: *Tailings Performance Criteria and Requirements for Oil Sands Mining Schemes (Directive 074)* and the ERCB's *Interim Directive ID 2001-07: Operating Criteria: Resource Recovery Requirements for Oil Sands Mine and Processing Plant Sites (ID 2001-07).* TOTAL indicated that its design focused on reducing the proportion of segregated fines that would be deposited in dedicated disposal areas, as required by *Directive 074*. TOTAL stated that it optimized the site layout to provide the area necessary for deposition of tailings on sand beaches to allow for dewatering and evaporation. TOTAL stated that it selected proven oil sands tailings technology that did not expand the project's footprint, had the lowest pre-production costs, and would meet *Directive 074* criteria.

With respect to surface mining alternatives, TOTAL stated that it evaluated mine plans using numerous criteria including economics, environmental impacts, social considerations, reclamation schedule, construction material availability, geotechnical criteria, and transportation logistics. In considering alternatives to the site layout and facility location, TOTAL stated that it evaluated several options for the plant site, off-stream storage pond, project camp, external tailings pond, opening cut, in-pit disposal sites, and external disposal sites and determined that the possible alternatives for the plant site demonstrated similar environmental effects and economics. It selected the proposed location for the plant site primarily to reduce plant footprint, increase tailings storage capacity, and facilitate operational efficiency to meet the requirements of *Directive 074*. TOTAL stated that it selected the preferred locations of the project camp and off-stream storage pond to maximize operational efficiency and minimize ore sterilization.[8]

TOTAL stated that it evaluated two alternative locations for the river water intake and several design possibilities for those locations. TOTAL's evaluation of the alternatives focused on costs, reliability of water supply, and regulatory approvals associated with navigation, fisheries, and geotechnical issues. TOTAL stated that its final proposed design—a bank river-water intake from the Athabasca River—was a result of a site and intake-type selection study that it conducted in collaboration with DFO and Transport Canada.

TOTAL stated that it evaluated five separate options for the diversion of Joslyn Creek. TOTAL assessed each alternative based on environmental, technical, and economic criteria, including minimizing the impacts on aquatic and terrestrial habitats and of bitumen resource sterilization. TOTAL stated that it selected its preferred alternative, a permanent diversion design for Joslyn Creek that would divert it into the proposed "no-net-loss" fish habitat compensation lake and to the Ells River, to minimize ore sterilization.

TOTAL indicated that an open pit would remain on the project site as a permanent feature in the landscape at the end of mining. TOTAL stated that it had assessed potential alternatives, including infilling the pit, based on environmental, technical, and economic criteria. TOTAL stated that backfilling the pit would be costly and that heavy equipment use would increase greenhouse gas emissions. TOTAL stated that the end pit lake was the preferred alternative—a necessary and desirable feature of the reclamation landscape initially providing key remediation benefits and subsequently providing desirable fish habitat.

4.2.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC stated that TOTAL had not demonstrated that end pit lakes would be technically or economically feasible for oil sands applications. OSEC further stated that TOTAL did not meet the terms of reference for the environmental assessment because it failed to take into account technically and economically feasible alternatives to using an end pit lake.

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[8] Ore sterilization results when permanent surface facilities are sited above oil sands deemed by the ERCB to be economically recoverable, thereby preventing recovery of the resource.

Government of Alberta (Untested Evidence)[9]

SRD stated that it required additional clarification of alternative mine plan options available to maintain a wider setback from the Ells River to maintain habitat connectivity. SRD stated that appropriate setbacks from rivers would be critical to protect key wildlife habitat values and wildlife movement corridors on the local and regional scales.

4.2.3 Panel Conclusions and Recommendations

The Panel finds that TOTAL has provided adequate information on technically and economically feasible alternative technologies and construction methods and has demonstrated sound reasoning in identifying the preferred alternatives.

The Panel accepts that truck and shovel mining with water-based bitumen extraction and tailings management are the preferred alternative means of carrying out the project.

The Panel also accepts that there is a need to divert Joslyn Creek to access bitumen reserves and that the proposed routing would minimize resource sterilization.

Subject to the Panel's consideration of the environmental impacts and proposed mitigation, the Panel also accepts that TOTAL's mine plan, plant site location, and overburden disposal areas would maximize resource recovery and are consistent with good engineering practices.

The Panel accepts that water is needed for the project and that the most suitable source is the Athabasca River. The Panel recognizes that TOTAL identified the preferred alternative for intake design and location in collaboration with DFO and Transport Canada.

Finally, the Panel notes TOTAL's proposal to include an end pit lake in the closure landscape. The Panel addresses the matter of the end pit lake as a reclamation tool and as a feature in the closure landscape in Section 12.

5 MINE PLAN AND RESOURCE CONSERVATION

5.1 Tailings

Tailings, the by-product of bitumen extracted from oil sands, is composed of water, sand, fines, and residual hydrocarbons. Fines are defined as tailings particles that are less than 44 microns diameter. While operators have applied fluid tailings reduction technologies, they have not met the targets set out in their applications; as a result, the inventory of fluid tailings that require long-term containment has grown. *Directive 074* sets out requirements for the regulation of tailings from mineable oil sands. *Directive 074* specifies performance criteria for the reduction of fluid tailings and the formation of deposits suitable for transport.

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[9] Some interveners did not attend the hearing and the submissions provided by these interveners did not get tested. The views provided in these submissions have been summarized where relevant; however the panel is unable to give this material much weight. Untested evidence has been formatted in grey color.

5.1.1 Views of TOTAL

TOTAL stated that it had applied technologies such as thickened tailings, centrifuged tailings, and sand spiking[10] with fines to meet the requirements of *Directive 074*. TOTAL also stated that its tailings management plan would result in no fluid tailings stored in its pit lake.

TOTAL stated that its thickened tailings technology would meet *Directive 074* requirements by capturing 55 per cent of the total mass of fines in the oil sands feed (more than the 50 per cent required by *Directive 074*), and by meeting the 5 kilopascal strength requirement one year after deposition. TOTAL indicated that it planned to have the thickened tailings deposits in dedicated disposal area 1 and dedicated disposal area 2 (Figure 2) at annual deposition rates of four to six metres and six to eight metres, respectively. TOTAL stated that it based its thickened tailings management plan on data from its testing and from other operators' field pilots, on consolidation modelling, and by targeting operating parameters that produce favourable strengths.

TOTAL stated that it would use centrifuged tailings technology to address fluid fine tailings that accumulate in Ponds 1 and 2. Four years are needed to build enough volume of tailings in the external pond before treatment; therefore TOTAL planned to apply this technology by 2021. TOTAL said that it would deposit the cake in polders[11] in the active sand beach areas. TOTAL further stated that it would collect additional fluid fines from tailings ponds for sand spiking to increase fines capture.

TOTAL stated that its sand beach areas would capture 15 per cent of fines. It noted that it would capture an additional 12 per cent of fines in the sand beach areas due to the spiking. TOTAL noted that at any given time the sand beach areas would have a fluid tailings volume equal to 3 million cubic metres at the toe of the area. TOTAL also stated that it would pump any runoff from the sand beach areas to the tailings ponds.

TOTAL indicated that it would, two years before operations, submit a detailed tailings management plan that would clearly demonstrate its ability to meet the annual 5 kilopascal strength requirement of *Directive 074*.

TOTAL recognized the importance of accurate measurement and monitoring of site-wide fines and noted that this was an area where more progress was required to better understand the performance of its tailings management plan and to satisfy the requirements of *Directive 074*.

5.1.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC stated its concern that TOTAL did not provide enough information about how it selected its proposed tailings management plan and about the alternative tailings management plans it considered and how it evaluated them. OSEC further stated that TOTAL provided insufficient information to understand how the tailings technology it chose was linked to the pit lake.

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[10] "Sand spiking" is the addition of fluid fine tailings to the coarse sand tailings stream to increase fines capture in the sand beach areas.

[11] A "polder" is a contained area where lower strength material is surrounded by material with a higher strength.

OSEC also stated its concern that TOTAL would not meet the fines capture and deposit strength requirements of *Directive 074* and that the ERCB would not enforce the requirements of *Directive 074* if TOTAL was found noncompliant. OSEC also raised concerns that *Directive 074* did not address legacy fluid tailings volumes.

Government of Canada

NRCan stated that, although it had been concerned initially with TOTAL's tailings management plan not meeting *Directive 074* requirements, TOTAL's responses had ultimately satisfied it and NRCan did not provide further tailings management recommendations.

5.1.3 Panel Conclusions and Recommendations

The Panel is of the view that TOTAL's proposed tailings plan is reasonable based on currently available technology. It also acknowledges that the plan has sufficient contingency to manage any unforeseen shortfalls because it uses a suite of technologies and it exceeds the requirements of *Directive 074*. The Panel accepts TOTAL's commitment to store no tailings in the end pit lake.

However, the Panel is concerned that thickened tailings with an annual deposition of six to eight metres has not been commercially demonstrated by industry to meet the 5 kilopascal requirements of *Directive 074*. The Panel notes that TOTAL is required to submit a detailed tailings management plan two years before commencement of operations and it expects that TOTAL will clearly demonstrate its ability to meet all requirements of *Directive 074*.

The Panel recognizes that further work is needed to address the accuracy of fines measurement in oil sands. The Panel notes that TOTAL is required to devise methods for measuring fines at the project in accordance with ERCB requirements.

The Panel recognizes TOTAL's ongoing pilot testing to further develop existing tailings technologies and processes and it expects TOTAL to notify the ERCB of all pilot and field-scale tailings testing. The Panel requires that TOTAL notify the ERCB in writing of any proposed pilot plants and/or demonstration plants for all technology development at least six months before construction of those facilities begins. It will also require TOTAL to provide written updates of any previously submitted test reports by no later than February 28 each year, or as otherwise specified by the Board.

The Panel is concerned that sand beach areas turn into conventional tailings ponds because of the amount of stored runoff. The Panel understands that TOTAL would pump all runoff from the sand beach areas into the tailings ponds and requires that TOTAL not exceed three million cubic metres of fluid in the sand beach area sumps.

5.2 Bitumen Recovery

5.2.1 Views of TOTAL

TOTAL stated that the froth production process would incorporate industry-standard processes, including primary separation cells, hydrocyclones, flotation units, and a deaeration unit. TOTAL selected an extraction process capable of operating at a temperature of 50 degrees Celsius to ensure that bitumen recovery targets would be achieved. TOTAL noted that with operational experience and plant optimization, the process operating temperature could be reduced further to optimize energy efficiency. TOTAL also indicated that the project would be designed and operated to maximize resource recovery. TOTAL stated that it designed its extraction process to achieve the bitumen recovery target outlined in *ID 2001-07*.

TOTAL noted that it would work with ERCB staff at the plant design stage to develop measurement plans that would satisfy the ERCB measurement requirements.

5.2.2 Panel Conclusions and Recommendations

The Panel expects oil sands developers to use extraction technology that will maximize resource recovery and reduce energy consumption. The Panel believes that the extraction process designed by TOTAL, in accordance with the bitumen requirements specified in *ID 2001-07*, would help it meet these goals.

The Panel accepts TOTAL's commitment to work with ERCB staff at the plant design stage to develop measurement plans. The Panel requires that one year prior to plant start-up, TOTAL provide measurement plans to the ERCB for review and approval, including process and instrumentation diagrams, metering, sampling methods, analytical methods and material balance procedures that satisfy ERCB measurement requirements.

5.3 Solvent Losses

5.3.1 Views of TOTAL

TOTAL stated that its froth treatment plant would include a two-stage countercurrent froth-settling circuit, a solvent recovery unit, and a two-stage tailings solvent recovery unit circuit. TOTAL indicated that it would recover solvent from the froth treatment tailings in a tailings solvent recovery unit prior to discharging to the tailings pond. TOTAL committed to maintaining solvent losses from the tailings solvent recovery unit to less than or equal to 4 volumes per thousand volumes of bitumen production on an annual average basis. TOTAL committed to monitoring solvent levels in the tailings stream and at the pond surface. TOTAL also committed to not discharging any untreated froth treatment tailings to the tailings disposal area.

5.3.2 Panel Conclusions and Recommendations

The Panel notes that it is important to recover the solvent that is used in the bitumen extraction process for environmental, health and safety, and resource conservation reasons. The Panel believes that TOTAL's plans for solvent recovery are appropriate. The Panel acknowledges TOTAL's commitment to limit annual average solvent losses from the tailing tailings solvent recovery unit to not more than 4 volumes of solvent loss per thousand volumes of bitumen production and will condition the approval accordingly.

The Panel also acknowledges TOTAL's commitment to not discharge any untreated froth treatment tailings to the tailings disposal area. The Panel requires that TOTAL not discharge any untreated froth treatment tailings to the tailings disposal area.The Panel requires that on an annual average basis, TOTAL limit site-wide solvent losses to not more than 4 volumes per thousand volumes of bitumen production under any operating conditions.

5.4 Asphaltene Rejection

5.4.1 Views of TOTAL

TOTAL stated that it selected a high-temperature paraffinic solvent froth treatment process. The primary goals of the selected process were to maximize the value of the bitumen product and meet the required pipeline transportation specifications. A portion of the asphaltene fraction in the bitumen is insoluble in the paraffinic solvent. The insoluble asphaltene, water, solids, and trace bitumen would be discharged to the tailings pond. TOTAL stated that it would manage the asphaltene rejection rate to meet product quality requirements and maximize the value of production.

TOTAL indicated that the ore has about 18 mass per cent of asphaltene in bitumen. TOTAL also indicated that asphaltene rejection of 7.7 mass per cent based on bitumen production would be required to maximize the resource value and meet the standard pipeline specification.

TOTAL requested approval for the flexibility to operate at an asphaltene rejection rate of 10 mass per cent annually, consistent with approvals granted to other operators but up to 12 mass per cent for short periods depending on market conditions.

5.4.2 Panel Conclusions and Recommendations

The Panel notes that TOTAL has proposed the operation of a high-temperature paraffinic solvent froth treatment process, which would result in asphaltene rejection and disposal of asphaltene as a component of the tailings solvent recovery unit tailings. The Panel accepts that higher quality deasphalted bitumen provides a more marketable product than non-deasphalted bitumen, but is concerned about the increased rejection of asphaltene because it is a potentially usable resource and excessive rejection of asphaltene may result in negative environmental effects.

The Panel acknowledges TOTAL's position that it needs the flexibility to operate at an annual asphaltene rejection rate of up to 12 mass per cent for short periods to deal with market conditions, but it also believes that the rejection of asphaltene should be minimized in order to maximize resource recovery and minimize environmental effects. The Panel is concerned that TOTAL's requested approval condition respecting the level of asphaltene rejection may not result in an appropriate recovery of the resource. The Panel notes that the current standard applied to most oil sands operators is to meet a maximum asphaltene rejection limit of 10 mass per cent on an annual average basis. The Panel has determined that this asphaltene rejection rate requirement provides enough flexibility on an annual basis to deal with short-term changes in market conditions. The Panel does not believe that TOTAL has justified a less stringent standard compared to other operators.

The Panel requires that on an annual average basis, the amount of asphaltene rejection be limited to 10 mass per cent based on bitumen production.

5.5 Geotechnical Issues

The ERCB is responsible for ensuring the geotechnical stability of overburden disposal areas, reclamation stockpiles, and mine pit walls. Appropriate (approved) geotechnical design for mine structures and setback distances from critical infrastructure, such as the CNRL road and the Ells River, are required to ensure public safety and prevent negative impacts to the environment.

5.5.1 Views of TOTAL

TOTAL stated that it would require out-of-pit or external disposal locations in addition to the disposal areas located in the mined-out pit for the permanent storage of material over the life of the project.

TOTAL also stated that it based the geotechnical design criteria used to define slopes and setback requirements of pit walls, tailings dikes, external disposal areas, creeks, the Ells River, lease boundaries, and critical and noncritical structures on data collected from five years of geotechnical drilling programs. TOTAL also stated that it would confirm setbacks during each engineering phase, based on a review of geological and geotechnical information, stability analyses, and overall risk assessment.

TOTAL noted that it would use the observational approach, which uses monitoring data, to optimize the geotechnical design during construction. TOTAL stated that this approach allows for the implementation of contingency measures, such as toe berms in the event of adverse performance monitoring results.

TOTAL stated that it would apply geotechnical designs and practices at the mine site that would meet or exceed industry standards and the Canadian Dam Association's Dam Safety Guidelines.

5.5.2 Views of the Interveners

Canadian Natural Resources Limited (Untested Evidence)

CNRL stated in writing to TOTAL that it wanted TOTAL to identify mitigation measures to prevent the location of the offstream storage pond, a reclamation stockpile, and the project camp from negatively impacting CNRL's operations. CNRL also indicated that it was concerned about the proximity of the project activities to the highway that could affect the operation of CNRL's Horizon Oil Sands Project. CNRL stated that it was concerned about the change to the haul road underpass for the major road crossings, under the highway, and between the mine pit and the tailings storage and waste disposal area facilities. CNRL further stated that it was concerned about the decrease in the geotechnical setbacks from the crest of the mine pit to the highway. CNRL stated that it looked forward to working cooperatively with TOTAL to address these issues for the success of both the Horizon and the Joslyn North Mine projects.

5.5.3 Panel Conclusions and Recommendations

The Panel expects that TOTAL would complete further geotechnical drilling and analyses for all critical mining structures to confirm the design assumptions presented in this application. The Panel recognizes that the mining industry widely uses the observational approach to optimize the construction of mining facilities. However, the Panel expects TOTAL to approach its geotechnical designs conservatively, implement sufficient monitoring systems, and have detailed contingency plans to implement mitigation measures to address potential worst-case scenarios.

The Panel requires that TOTAL submit detailed geotechnical designs for all external overburden disposal areas and reclamation stockpiles to the ERCB at least six months prior to conducting any field preparation in these areas. As well, the Panel requires that TOTAL submit to the ERCB, for its review and approval, detailed geotechnical designs and setback distances for critical infrastructure two years prior to site preparation activities for the ore preparation plant pit, the west and southern final pitwall, and for the final pitwall design and assessed setback from the Ells River.

The Panel further discusses the required setback distances from the Ells River to ensure the protection of wildlife in Section 6.1.

5.6 Lease Boundary Mining

TOTAL and CNRL share a common lease boundary. TOTAL's ore body in the north part of its mine pit extends across the lease boundary into CNRL's South Pit.

The Panel recognizes that it can be difficult for two companies to coordinate their mine plans to recover the oil sands resource along a common lease boundary. The norm has been to leave behind an oil sands pillar which results in the sterilization of several million barrels of recoverable bitumen. The ERCB requires operators to apply for approval of such resource sterilization in accordance with Section 3.1 of *ID 2001-07.*

5.6.1 Views of TOTAL

TOTAL stated that it was working with CNRL to coordinate their mine plans along the common lease boundary. TOTAL stated that there was potential for CNRL and TOTAL to recover about 60 million barrels of bitumen east of the CNRL road if a pillar of oil sands could be recovered at the common lease boundary between the two projects. TOTAL stated that the goal would be to have full resource recovery between the two mines. TOTAL advised that at the time of the hearing, the lease boundary plans had not been finalized.

5.6.2 Views of Interveners

Canadian Natural Resources Limited (Untested Evidence)

In its written submission, CNRL stated that it would be in the best interest of TOTAL and CNRL to work together on issues that affect both the Horizon and Joslyn North Mine projects. CNRL further stated that it has a history of working cooperatively with TOTAL for mutual benefit and it sought to continue this cooperative working relationship.

5.6.3 Panel Conclusions and Recommendations

The Panel notes that TOTAL has been working with CNRL to develop mine plans that maximize resource recovery at the common lease boundary, but that, at the time of the hearing, the plans had not been finalized. The Panel understands this to mean that the plans may be nearly complete. The Panel expects that TOTAL will continue its working relationship with CNRL and develop mine plans that maximize resource recovery at the common leas boundary.

The Panel deals with the matter of reclamation across lease boundaries in Section 10.

5.7 Setbacks from Mine Features and Facilities, and the Ells River

Under Alberta legislation, the ERCB's responsibilities are to conserve and prevent waste of the oil sands resources of Alberta in an orderly and economic manner in the public interest. The ERCB is also responsible for having regard for the social, economic, and environmental effects of the project.

The project's proposed mining limit is situated as close to the Ells River as possible to maximize the recovery of oil sands resources. However, to protect the environment, there is also a need to limit the area between mine development and the river to ensure that the project effects on wildlife would be minimized. Studies conducted by TOTAL have determined that wildlife species protected under federal (*Species at Risk Act*) and provincial legislation (*Alberta Wildlife Act*) exist on, and near, the lands required for the project. The project design and mitigation strategies are important when considering how to provide for wildlife movement around the project and protect nearby listed species. The project effects on wildlife and strategies to mitigate effects to wildlife are discussed further in Section 6.1.

5.7.1 Views of TOTAL

TOTAL proposed a minimum 100-metre setback from the 100-year flood level of the Ells River to the mine pit based to ensure geotechnical stability, to protect the valley-wall against erosion processes, and to maximize resource recovery. TOTAL indicated that the mineable resource extends to areas along the mine pit to the Ells River valley. TOTAL proposed to minimize the Ells River setback to recover mineable resources to meet the requirements of *ID 2001-07*.

TOTAL stated that the restriction of not mining within the 250-metre setback from the Ells River recommended by EC for the purposes of wildlife protection would sterilize about 120 million barrels (19 million cubic metres), or about 16 per cent of the identified mineable resource. TOTAL further stated that the loss of this resource would either shorten the mine life or reduce the daily extraction feed rate; either one of these options would severely impact the economics of the project.

TOTAL stated that the location of the offstream storage pond, the project camp, the plant site, external disposal area C, and the compensation lake would be directly impacted by a 250-metre setback from the Ells River because they were proposed to be either located within or partially within the recommended setback. TOTAL further stated that the main factor in locating these mine facilities was to optimize resource recovery. TOTAL stated that although it was possible to relocate the offstream storage pond and the project camp to the south side of the CNRL road, it would be cramped. It said that if one or the other had to be moved, it would prefer to move the project camp. TOTAL stated that the biggest impact to the project would be the relocation of the offstream storage pond. TOTAL stated that the location of the plant site would be impacted by the EC setback. TOTAL stated that the EC setback would decrease the storage capacity of external disposal area C. TOTAL indicated that the compensation lake was sited in its proposed location to prevent resource sterilization on the west side of its lease. TOTAL added that the compensation lake should be exempt from the setback suggested by EC because it would become a permanent structure in the landscape.

5.7.2 Views of Interveners

Views of interveners with respect to a setback from the Ells River for wildlife purposes can be found in Section 6.1.

5.7.3 Panel Recommendations and Conclusions

The Panel notes that there is uncertainty regarding the appropriate setback from the Ells River to prevent adverse impacts on various wildlife species, including those protected by federal and provincial legislation. The Panel agrees with TOTAL that the Ells River valley is a physical constraint and disadvantage to wildlife movement through the area. The Panel acknowledges that the potential loss of bitumen reserves from a setback between the Ells River valley and a clearing for the project and the Ells River valley may affect the economic viability of the project. The Panel finds that a setback between the Ells River valley and a clearing for the project is required to mitigate the effects of the project on wildlife and wildlife movement, particularly to protect high-quality habitat for federally and provincially protected wildlife in the Ells River valley.

It appears to the Panel that the setbacks required to deal with geotechnical matters would be less than those required for wildlife matters. The Panel agrees with TOTAL that the compensation lake should be exempt from the setback suggested by EC because it would become a permanent structure in the landscape.

Details regarding the determination of the appropriate width of a wildlife travel corridor between the project and the Ells River valley are in Section 6.1.

6 ENVIRONMENTAL EFFECTS

TOTAL used the following assessment cases to assess the effects on the various environmental receptors in the local study area:

- baseline case—provides an assessment of the combined changes from existing and approved developments

- application case—provides an assessment of the combined changes from all developments considered in the baseline case in addition to the revised project.

TOTAL used two different application cases, one provided impacts of the project at full build-out and the other represented the effects after project closure which included final reclamation plus seven years.

The local study areas for the environmental assessment of the project are different for the different environmental receptors.

6.1 Wildlife

6.1.1 Views of TOTAL

Methods

TOTAL's wildlife assessment focused on the following valued ecosystem components: moose, black bear, fisher, Canada lynx, snowshoe hare, beaver, ruffed grouse, northern goshawk, great gray owl, yellow rail, waterfowl, mixed wood forest birds, old-growth forest birds, and Canadian toad. Of these, the yellow rail is the only species listed under the *Species at Risk Act*. TOTAL chose all other species as valued ecosystem components as they were sensitive species, determined as 'may be at risk' by SRD, or considered priority species by the Cumulative Environmental Management Association (CEMA).

The Panel requested that TOTAL assess all species at risk listed under the *Species at Risk Act* and listed as "sensitive", "at risk", or "may be at risk" in the *General Status of Alberta Wild Species 2005* that may occur in the regional study area. TOTAL responded by providing additional information for yellow rail, short-eared owl, common nighthawk, olive-sided flycatcher, Canada warbler, rusty blackbird, and western toad. TOTAL stated that it did not include provincially listed species and species listed by the Committee on the Status of Endangered Wildlife in Canada because it would deal with those species in cooperation with SRD and AENV if the project was approved. TOTAL stated that it did not quantitatively assess woodland caribou, wood bison, northern leopard frog, and the peregrine falcon because these species were not known to occur in the local study area or were sighted only on occasion. As a result, TOTAL indicated that it did not expect the project to affect those species. TOTAL did not assess the project's potential impacts to the endangered whooping crane. It stated that it was not aware of any conflicts between oil sands projects and whooping cranes.

The local study area for wildlife incorporated lands within 500 metres from the southern crest of the Ells River valley to include the valley and followed the bank of the Athabasca River in the east. The total size of the local study area was 11 272 hectares.

TOTAL completed baseline studies which included field surveys (winter track count, ungulate aerial, pellet group) of the following species: bat, owl, diurnal hawk, waterfowl, breeding bird, and Canadian toad. TOTAL mapped locations of species that it observed. To respond to additional information requested by the Panel in 2010, TOTAL conducted further field surveys for species at risk.

TOTAL used Habitat Suitability Index[12] models to estimate available habitat in both the local study area and regional study area. TOTAL indicated that habitat units reflected both habitat quality and quantity. TOTAL stated that it assessed habitat connectivity for moose and black bear in terms of movement potential and quantified it using linkage zone modelling.[13] TOTAL assessed direct mortality risk for the Canadian toad, moose, and black bear and indirect mortality risk for the Canada lynx, moose, and black bear.

For species at risk, TOTAL assessed habitat availability using habitat modelling and mapping techniques. It used the wildlife models for species at risk to estimate the amount and quality of available habitat and also categorized habitat for species at risk into high, medium, and low quality. These models included the effects of noise and other sensory disturbances by using recognized buffers of reduced habitat values surrounding footprints of actual disturbance. For each species at risk, TOTAL provided maps indicating where the high, medium, and low quality habitat occurred in the local study area. Some of the maps also included locations where TOTAL observed the species. TOTAL stated that it based its population estimates on best available information. TOTAL also assessed the potential for direct mortality risk for species at risk.

Results

TOTAL predicted a loss of habitat in the local study area for each of the species from the baseline case to the project at full build-out and also after reclamation. The project effects at full build-out ranged from a 47 per cent loss of habitat for northern goshawk to a 61 per cent loss of habitat for the Canadian toad. The predicted change in habitat availability after reclamation ranged from a reduction in habitat of 46 per cent for the northern goshawk to an increase in habitat of 36 per cent for black bear when compared to the baseline case. In the regional study area, TOTAL predicted the percentage of habitat that would be available at full build-out for the valued wildlife. In doing so, it used the planned development case[14] and compared it to the baseline case. The habitat remaining in the regional study area ranged from 86 per cent for old-growth forest birds to 90 per cent for fisher, black bear, and moose. TOTAL concluded that the effects on valued wildlife were insignificant because there was sufficient habitat in the regional study area to sustain viable populations of these species.

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[12] These models used habitat units to indicate the number of habitat units of high, medium, and low quality habitat available for each valued ecosystem component. Many biophysical variables or parameters were used to determine habitat suitability. Zones of influence were used to represent the effects of activities and disturbance on a particular species and therefore the reduction in the quality of the particular habitat being assessed. The Habitat Suitability Index models were validated with baseline field data for most of the valued ecosystem components.

[13] Linkage zone modeling considered the distribution of wildlife habitats and types and areas of human disturbance across the landscape.

[14] The planned development case provides an assessment of the combined changes from existing and approved developments, the project, and planned developments in the regional study area.

TOTAL predicted a loss of habitat in the local study area for each species at risk ranging from 46 per cent for the Canada warbler to 83 per cent for the common nighthawk for full build-out of the project before reclamation compared to the baseline case. TOTAL predicted the change in habitat after reclamation to range from a reduction of 50 per cent for the short-eared owl to an increase of 196 per cent for the western toad in the local study area when compared to the baseline case. TOTAL provided information on the percentage of remaining habitat available for species at risk in the regional study area. In doing so, it compared the planned development case to pre-industrial conditions, not to the baseline case it used for valued wildlife. TOTAL indicated that the habitat remaining in the regional study area ranged from 66 per cent for western toad to 85 per cent for the common nighthawk. TOTAL stated that the effects to species at risk were not significant as there was sufficient habitat available in the regional study area to sustain viable populations of these species.

TOTAL recognized that there was going to be a significant effect in the local study area during the operation of the project but that it was reversible as TOTAL would reclaim habitats. TOTAL noted that some habitats, such as old-growth forest, would take much longer to re-establish (more than 100 plus years) than the closure-plus-seven-years application case. TOTAL also stated that its proposed project was in an area zoned within the Terrestrial Environmental Management Framework for multi-resource use and that the residual habitat values that would remain within the regional study area would be capable of sustaining ongoing wildlife diversity. TOTAL stated that the 60 per cent threshold for residual habitat in the regional study area was appropriate for lands zoned for intensive resource use.

With regard to habitat connectivity, TOTAL noted that under full build-out, the project footprint would limit the movements of moose and bear through the majority of the Ells River valley. TOTAL stated that the narrow incised and steep valley slopes associated with the Ells River valley present a physical constraint and disadvantage to animals moving through the area. On this basis, TOTAL further stated that there was no reason to believe that its proposed 100-metre setback from the 100-year Ells River flood level would threaten habitat connectivity in the region or that widening the setback would be necessary for wildlife movement in the region.

TOTAL indicated that it assessed direct mortality risk for the Canadian toad, moose, and black bear because estimates of direct mortality could be made based on habitat requirements or data already available on mortality. TOTAL assessed the direct mortality for Canadian toads by determining that the project would result in the loss of 12 of the 16 locations where it found toads overwintering during baseline surveys. It predicted that there would be an additional 0.3 vehicle collisions per year for moose and 0.1 per year for black bear. TOTAL did not expect that the project's contributions to mortality risk would have an effect on the sustainability of these species in the regional study area.

TOTAL also examined indirect mortality risk for three indicator species: moose, black bear, and Canada lynx. TOTAL indicated that it assessed indirect mortality caused by hunting, trapping, and predation due to increased access by estimating the remaining available core security habitat (habitat that is buffered from these disturbances). TOTAL found that there would be measurable losses of core security habitat from the project in the local study area but that there would be sufficient core security habitat in the regional study area to sustain viable populations of these species.

As requested by the Panel, TOTAL provided information on instances of waterfowl-tailings ponds interactions occurring in the oil sands region. TOTAL provided data from Suncor Energy and Shell Muskeg River Mines. It included the number of birds affected by each incident, mortality rates, and types of deterrent technology in place at the time. Suncor's data showed bird recoveries from 1975 to 2009 and indicated an average of 85.4 birds per year while Shell's average was 9.9 birds per year from 2003 to 2009.

TOTAL also assessed direct mortality risk associated with the project for species at risk. TOTAL stated that the clearing associated with site preparation and operations would be the greatest potential cause of bird mortality. TOTAL indicated that collisions with vehicles, buildings, and powerlines, as well as exposure to chemicals could also cause mortality. TOTAL noted that clearing and drainage for site preparation and operations would cause the greatest potential risk of mortality for the western toad and that exposure to chemicals could also pose a risk.

TOTAL provided population estimates for species at risk that it assessed (Table 2). TOTAL predicted that the populations of all of the assessed species would decline when the project was at full build-out. TOTAL noted that it expected that populations would then increase after reclaiming the site.

Table 2. Population estimates of species at risk in the local study area[15]

Species	Baseline	Application case (full build-out)	Application case (closure plus 7 years)
Yellow rail	80	16	32
Short-eared owl	5	1	4
Common nighthawk	552	74	1178
Olive-sided flycatcher	44	12	40
Canada warbler	1311	593	1254
Rusty blackbird	441	130	927
Western toad	125	45	372

TOTAL also mapped observations of species at risk in the local study area, including the short-eared owl, common nighthawk, olive-sided flycatcher, and the Canada warbler.

Mitigation

TOTAL noted that its main mitigation measure would be progressive reclamation of the project area. TOTAL also proposed other mitigation measures which included

- protecting a 50-metre setback between the Ells River valley crest and the mine site, and a 150-metre setback from both sand beach area 1 and external disposal area C;
- avoiding sensitive wildlife habitats to the greatest extent possible;

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[15] Taken from Table 20-1, Exhibit No. 001-054

- avoiding clearing[16] during the migratory bird breeding season;
- erecting wildlife cautionary signage;
- managing the interaction between wildlife and tailings ponds by implementing various land-based and floating deterrent systems which may include propane cannons, lights, mechanical devices, and radar detection;
- committing to include accepted industry standard bird deterrent technology in the project design, adopting a deployment date that ensures that the systems are operating when migratory birds arrive in the area, and employing adaptive management to optimize the efficacy of bird deterrent systems;
- developing and implementing bird recovery and treatment systems;
- using vegetative control measures to avoid attracting wildlife to tailings ponds;
- protecting wildlife from harassment;
- restricting hunting or use of firearms by personnel, including contractors;
- restricting public access to the area; and
- avoiding critical habitat where possible, once critical habitat is defined.

Significance

TOTAL defined a significant adverse effect as one that is likely to result in a long term or irreversible loss of wildlife diversity in the regional study area. TOTAL stated that the mine footprint would occupy most of the local study area; however, it assessed significant adverse effects to all wildlife in the local study area by using a threshold of 60 per cent for habitat remaining in the regional study area. TOTAL stated that the relevance of the project effects was more appropriately assessed in a regional context using regional resource characteristics, management strategies, and land use policies. TOTAL stated that the majority of the evidence it reviewed supported a 30 per cent residual habitat threshold at a landscape level to avoid rapid declines that might lead to regional extirpation. Therefore, TOTAL noted that its threshold was precautionary when compared to 30 per cent.

TOTAL stated that the project would not cause significant adverse effects on wildlife, including species at risk. When asked why TOTAL chose to define significance of effects on species at risk as a no long-term loss of biodiversity rather than using criteria based on the *Species At Risk Act*, TOTAL noted that a residual habitat threshold of 60 per cent of pre-industrial conditions suggested that there would be sufficient habitat on the landscape to ensure no loss of species diversity. TOTAL added that critical habitats for species at risk were not yet defined and that once such habitats were defined, it would become easier to set additional thresholds to define what would be a significant effect.

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[16] TOTAL noted that Alberta Pacific Forest Industries Inc. (Al-Pac) planned to salvage merchantable timber on parts of the Joslyn Lease and that Al-Pac sets its own clearing schedule under its operational protocols and guidelines. TOTAL stated it does not have any control of Al-Pac operations.

Follow-up Monitoring

With regard to follow-up monitoring, TOTAL stated that it would consult with SRD, other stakeholders, and possibly other operators in the area to develop a specific wildlife monitoring program if the project was approved.

TOTAL stated that it planned to consult with EC and provincial agencies to develop a project-specific monitoring program to complement the types of information on migratory birds being collected by the Alberta Biodiversity Monitoring Institute. It stated that the objectives of the monitoring program could include

- assisting in critical habitat identification for these species;
- assisting in identifying and developing more detailed reclamation prescriptions for restoring habitat values for these species on the closure landscape; and
- monitoring the effects of the project on the residual habitat use of species listed under the *Species at Risk Act* on the lease.

TOTAL noted specific monitoring that it planned to conduct for species at risk, including

- assessing the success of habitat recovery and wildlife recolonization on the closure landscape,
- guiding ongoing reclamation activities, and
- contributing information to the *Species At Risk Act* and Lower Athabasca Regional Plan[17] initiatives.

TOTAL also committed to participating in the bird deterrent monitoring program currently being developed by provincial regulators and in the Oil Sands Wildlife Protection Committee, which facilitates an ongoing process to evaluate the efficiency of bird deterrent systems.

6.1.2 Views of Interveners

Sierra Club Prairie

Sierra Club Prairie noted that reductions in habitat of up to 39 per cent for wildlife species would be significant, especially if using a 10 or a 20 per cent critical threshold. It pointed out that a 20 per cent threshold has been used in previous assessments of oil sands projects.

Oil Sands Environmental Coalition

OSEC criticized TOTAL's determination of the significance of effects for wildlife. It disagreed with TOTAL's threshold of 60 per cent for remaining habitat which TOTAL defined as not significant. OSEC noted that the thresholds and management objectives outlined in the CEMA *Terrestrial Environmental Management Framework* should have been used by TOTAL.

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[17] The Lower Athabasca Regional Plan will identify and set resource and environmental management outcomes for air, land, water and biodiversity and guide future decisions on resources while considering social and economic impacts.

Fort McKay First Nation and Métis Nation Local #63 (Untested Evidence)[18]

Fort McKay indicated that TOTAL did not provide sufficient empirical data and statistical analysis to support its ecological thresholds for wildlife habitat. It disagreed with TOTAL's proposed 60 per cent habitat threshold. Fort McKay recommended that a loss of more than 20 per cent in high quality wildlife habitat should be considered a high magnitude impact.

Fort McKay was concerned that TOTAL had not developed a concrete plan for mitigation. It stated that TOTAL committed to "working with" and "investigating" a mitigation strategy without specific actions. Fort McKay did not agree with how TOTAL determined the significance of effects for wildlife populations. It noted that TOTAL should use wildlife population surveys rather than habitat modelling to estimate population effects.

Fort McKay stated that TOTAL should have assessed impacts on woodland caribou populations because TOTAL had identified caribou habitat in the local study area and indicated that it had received traditional knowledge that caribou had been present in the local study area.

Athabasca Chipewyan First Nation (Untested Evidence)

ACFN recommended that TOTAL provide adequate and effective wildlife corridors either through or around the project area for the life of the project. ACFN also recommended that TOTAL re-establish appropriate wildlife habitat in the closure landscape and re-establish key wildlife species to target densities within the project area.

Non-Status Fort McMurray Band Descendants, Clearwater River Band No. 175

The groups indicated that the information related to species, particularly species at risk in the area, was deficient because TOTAL did not use actual population or habitat occupancy data. They also indicated that TOTAL's species at risk assessment should have included wood buffalo, whooping crane, Canadian toad, peregrine falcon, grizzly bear, wolverine, and leopard frog. The groups expressed additional concern that post-reclamation habitat availability would not resolve effects on populations if these populations decrease to extinction before reclamation is complete.

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[18] As noted by the panel in Section 3, Fort McKay, ACFN and MCFN withdrew their opposition to the project, but their submissions remained on the record. The evidence provided by these interveners did not get tested. The views provided in the submissions have been summarized where relevant; however the panel is unable to give this material much weight. Untested evidence has been formatted in grey color.

Government of Canada

Migratory Birds

EC noted that it was concerned about

- the loss of direct and indirect habitat during the years of mine operation;
- the absence of secure habitat within the regional study area during the years of mine operation that could act as a source for repopulating species in reclaimed areas;
- the success of habitat restoration during the extended reclamation phase;
- the mitigation proposed by TOTAL for migratory birds, which remains uncertain due to a lack of data and information provided, including quantitative baseline population data;
- the lack of information on the variables used in the models and the relationship between those variables and the birds; and
- the monitoring of migratory birds proposed by TOTAL, which EC stated would not allow for the direct calculation of the project's effects on population of individual species of migratory birds.

EC noted that crowding effects in birds have been documented when habitat is removed and birds move into adjacent habitats. It indicated that crowding has negative effects on birds but that the effects do decline over time.

EC stated that a lack of scientific information on the characteristics of effective wildlife habitat corridors in the boreal forest limited the ability of TOTAL and regulatory bodies to make sound recommendations on long-term corridor requirements for wildlife. EC noted that even though there is a lack of evidence regarding the function of the Ells River valley as a wildlife movement corridor, this area would become increasingly important in maintaining connectivity over time as adjacent habitats are lost and fragmented and cumulative effects become more prominent.

EC recommended that TOTAL

- identify source habitats for recolonization and identify opportunities for off-site mitigation to conserve source habitats for recolonization until on-site reclamation criteria are met;
- provide documentation to support the assumption that remaining habitat can support source populations for recolonization of reclaimed landscapes;
- avoid bird habitat destruction at least from April 1 to August 31;
- use the best available bird deterrent technology and apply ongoing adaptive management to optimize the efficacy of bird deterrence;
- develop a bird deterrent deployment plan that includes annually monitoring the timing of migration to ensure deterrent systems are installed and deployed before migratory birds arrive;

- establish a monitoring program to estimate population densities, which would then be compared against estimates of the natural range of variation for these species; and

- ensure that monitoring results are available to the public.

Species at Risk

EC noted that it was concerned with

- the assumption that remaining habitat could support the populations necessary to serve as a source for recolonization of populations in reclaimed landscapes;

- the potential effects to the endangered whooping crane as its migration pathway intersects the oil sands region and have been seen in areas close to oil sands;

- TOTAL's western boreal toad abundance estimates, which EC noted may have been underestimated since the data used for the estimates were only from call surveys and western toads have infrequent vocalizing habits and lack vocal sacs;

- the proposed width of the wildlife corridor along the Ells River valley, particularly because the Ells River corridor is important habitat for the Canada warbler and studies have shown impacts on occupancy rates and pairing success for some species of birds for distances of up to 700 metres with noise sources greater than 42 dBA;

- the uncertain success of the mitigation proposed by TOTAL due to a lack of data and information provided;

- the lack of information, such as locations of surveys, provided by TOTAL with regard to the methodologies used to detect species at risk;

- the uncertainties about how TOTAL used variables in models; for example how TOTAL decided noise, zone of influence, and other variables for each of the species at risk;

- the effectiveness of TOTAL's reclamation strategy for species at risk, specifically the uncertainty with how long it would take for species at risk to recolonize the area. EC indicated that in order to reclaim habitat for species at risk, the actual processes on which the species depend must be reclaimed. EC was not confident that this would be completed for the habitats of species at risk in the local study area;

- the loss of peat lands since this type of habitat is important for a large number of species, including the rusty blackbird, a federally listed species; and

- the loss of old-growth forest community and the extent that this ecosystem would redevelop and be comparable to a natural system.

EC agreed that a 20 per cent loss of habitat is the general threshold used for most environmental assessments but that the threshold would vary by species. EC also noted that this percentage might be conservative for some species but would be risky for others. EC stated that the risk tolerance for species at risk is low and that special consideration should be given to such species.

EC recommended that TOTAL

- undertake a specific assessment of the risk of tailings ponds and other project infrastructure on whooping cranes, work with other oil sands industry proponents to further assess these potential impacts on whooping cranes, and undertake time sensitive monitoring of the presence of whooping cranes;
- establish minimum setback distances of between 200 metres and 350 metres around nests of species listed under the *Species at Risk Act* (Table 3);
- include the following elements in the mitigation plans for each species at risk known to occur in the local study area:
    - provide documentation to support the assumption that remaining habitat in the planned development case can support the populations necessary to serve as a source for repopulating reclaimed landscapes;
    - determine habitat attributes for each species in order to develop reclamation targets (i.e., habitat structure, trophic attributes, and extent of habitat required to re-establish populations in the reclaimed landscape);
    - identify source habitats to ensure species can re-establish in the reclaimed area; and
    - identify opportunities for off-site mitigation to protect source habitats for re-establishing populations.
- commit to participating in regional biodiversity conservation planning to ensure impacts to species at risk habitat are offset through permanent regional protection of refuge habitat;
- use the *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada* which outlines the standards and expectations for reclamation and mitigation;
- avoid species at risk and their critical habitats;
- present a thorough rationale for assigning the particular densities to habitat categories;
- continue to monitor species at risk populations in the local study area and, in addition to collecting population data, develop locally relevant habitat profiles for each species to guide habitat reclamation;
- undertake ongoing evaluation of literature to improve estimates of habitat selection for developing reclamation plans and evaluating the efficacy of monitoring efforts;
- use visual surveys of ponds in the breeding season as recognized protocol for monitoring the western toad;
- relocate large western toad populations from areas in which dewatering or land clearing activities are planned;

- address the uncertainties respecting the development of models to determine habitat quantity and quality;
- lead an effort, in partnership with other companies operating in the region, to
  - collect baseline data on wildlife use in the Ells River valley and adjacent upland habitats; and
  - study wildlife use of corridors that have been and would soon be created through the construction of oil sands mines;
- present appropriate corridor widths based on locally relevant wildlife movement research that address EC's concerns prior to construction;
- implement noise attenuation measures in the Ells River area; and
- conduct monitoring at the edge of the setback area to verify that noise levels are maintained at less than 42 dBA. EC stated that monitoring of nesting activity may determine the most appropriate noise thresholds for species at risk.

EC stated that its original recommendation for a minimum 250-metre setback from the Ells River did not take into account the presence of suitable habitat in the Ells River valley for species listed under the *Species at Risk Act*. EC was concerned about protecting wildlife during the breeding season and maintaining functional habitat in the future to continue to support species listed under the *Species at Risk Act*. EC recommended setback distances from nests of migratory bird species listed under the *Species at Risk Act* from May 1 to July 31 (Table 3).

Table 3. Setback distances from the nests of migratory bird species listed under the *Species at Risk Act*[19]

Species	Setback (metres)
Canada warbler	300
Olive-sided flycatcher	300
Rusty blackbird	300
Common nighthawk	200
Yellow rail	350

Government of Alberta (Untested Evidence)

SRD stated that appropriate setbacks from rivers would be critical to ensure mitigation for key wildlife habitat values and wildlife movement corridors. SRD indicated that it required additional clarification of potential options available to maintain a wider setback than proposed by TOTAL without adversely impacting the proposed mine project. SRD would like more detailed discussion on exploring options for maintaining habitat connectivity at the local and regional scales.

SRD indicated that it required clarification on the assessment of the alternative options and justification for the proposed location of the project camp. In addition, SRD requested an assessment of the potential impacts of the project camp on local fisheries, wildlife movement, and habitat connectivity along the Ells River.

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[19] From Exhibit No. 004-027, EC.

SRD stated that it would be helpful in its future management of public lands for the project if the Panel's decision clearly define setbacks or indicate that SRD determine the setbacks.

6.1.3 Panel Conclusions and Recommendations

6.1.3.1 Species at Risk

The Panel believes that the evidence presented makes it clear that high quality habitat for species at risk would be destroyed during project construction and that this habitat would not be restored for decades; clearly an adverse effect of the project. The Panel understands that it must determine the significance of this effect and what measures may be appropriate to mitigate it.

The Panel notes that TOTAL focused its environmental assessment mainly on federally listed species at risk. The Panel similarly focused its assessment.

The Panel notes that TOTAL assessed species at risk that TOTAL observed or believed would likely be found in the local study area: yellow rail, short-eared owl, common nighthawk, olive-sided flycatcher, Canada warbler, rusty blackbird, and western toad. The Panel notes that TOTAL provided qualitative rather than quantitative assessments for peregrine falcon, woodland caribou, wood bison, and northern leopard frog. TOTAL stated that it considered these species to be either absent from the local study area or very infrequent visitors and that there was either a lack of suitable habitat or a lack of demonstrated use of the local study area. The Panel determines that this was a suitable approach as the project is unlikely to affect these species. The Panel also notes that TOTAL did not assess the whooping crane in its submission; however, EC was concerned about this species as its migratory path is over the oil sands area.

Based on the foregoing, the Panel focused its assessment on the following species at risk: the yellow rail (special concern), short-eared owl[20], common nighthawk (threatened), olive-sided flycatcher (threatened), Canada warbler (threatened), rusty blackbird (special concern), western toad (special concern), and, as a species that migrates through the area, the whooping crane (endangered).

The Panel recognizes that the proposed project would occur on provincial lands and that the *Species at Risk Act* does not directly apply to these lands. However, the Panel is obligated to determine the effects on federally listed species at risk pursuant to the *Canadian Environmental Assessment Act* and recommend mitigation measures to avoid or lessen effects on these species. The agreement to establish a joint panel for the project also instructs the Panel to include in its assessment of environmental effects any effects on federally listed species. The Panel notes that TOTAL committed to some mitigation measures to avoid or lessen effects on species at risk in the local study area but proposed to rely primarily on reclamation to mitigate these effects, meaning that the effect on these species would last several decades.

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[20] The short-eared owl is listed on Schedule 3 and is currently under review for an addition to Schedule 1 of the *Species at Risk Act*. It is not a federally listed species yet. However, TOTAL assessed this species in accordance with EC's recommendation.

The Panel notes that TOTAL associated no long term loss of biodiversity with an insignificant effect on species at risk. In TOTAL's view, the effects on species at risk would not be significant because, in the very long term, biodiversity would not be reduced. EC expressed concern with the ability of these species to absorb the impacts and TOTAL's ability to reclaim lost habitats. EC and other interveners indicated that species at risk need special treatment. To this end, the Panel notes that EC stated that the risk tolerance for species at risk is much lower than for common species.

For the species at risk assessed by TOTAL, the Panel calculated the percentage of remaining habitat in the local study area for the project at full build-out and after reclamation using data provided by TOTAL in its submission (Table 4). The Panel looked at total habitat as well as high quality habitat as defined by TOTAL. The Panel found that both total and high quality habitats would be reduced significantly at full build-out.

Table 4. Habitat availability in square kilometres for species at risk in the local study area[21]

					Per cent of habitat remaining compared to baseline (%)	
Species	**Habitat class**	**Baseline**	**Application case (full build-out)**	**Application case (closure plus 7 years)**	**Application case (full build-out)**	**Application case (closure plus seven years)**
Yellow rail	High	5	1	2	20	40
	Total	5	1	6	20	120
Short-eared owl	High	0	0	0	0	0
	Total	4	1	2	25	50
Common nighthawk	High	16	2	38	13	238
	Total	46	8	75	17	163
Olive-sided flycatcher	High	0	0	0	0	0
	Total	9	3	9	33	100
Canada warbler	High	11	7	7	64	64
	Total	35	19	28	54	80
Rusty blackbird	High	10	3	29	30	290
	Total	35	10	38	29	109
Western toad	High	2	1	6	50	300
	Total	25	10	74	40	296

In an effort to identify a test to determine what would be considered a significant effect to these species, the Panel relied on both federal and provincial legislation intended to protect species at risk:

- The *Species at Risk Act* protects federally listed species at risk when they occur on federal lands. Section 32(1) states that "No person shall kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species." Section 33 states that "No person shall damage or destroy the residence of one or more individuals of a wildlife species that is listed as an endangered species or a threatened species..." The Panel notes that the yellow rail, rusty blackbird, and western toad are species of special concern, not threatened or endangered species. Although the project occurs on provincial lands, these sections assist in determining what could be considered a significant effect to a species at risk.

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[21] Adapted from Table 23-1, Exhibit No. 001-054. The panel modified the original table submitted by TOTAL by examining only the high quality and total habitat for each species and removed the low and moderate quality habitat information from the table. The panel provided the percentage of remaining habitat instead of showing the percentage of habitat lost for each species as was shown in TOTAL's original table.

- Section 36(1) of the *Alberta Wildlife Act* states that "A person shall not wilfully molest, disturb or destroy a house, nest or den of prescribed wildlife...in prescribed areas and at prescribed times."
- The *Migratory Bird Conventions Act* applies on all federal and provincial lands. The Migratory Bird Regulations prohibit the disturbance of nests or eggs of migratory birds without a permit from the federal Minister of the Environment and prohibit the release of pollution, such as oil and oil wastes in any waters or area frequented by migratory birds.

The Panel believes that because of the above legislated protection for species at risk, the measure for determining significant adverse effects should be any net harm to an individual of the species, its residence, or its critical habitat. The Panel is of the view that destroying high quality habitat for species at risk and damaging their residences would constitute a significant adverse effect of the project. Certain species, such as the western toad, would also be destroyed if the project proceeds. Several other species, especially birds, also reside within the project footprint.

The Panel concludes that the effects to species at risk within the local study area are significant because

- high quality habitat of species at risk, which contain residences and individuals, would be directly affected;
- habitat would be lost for decades;
- uncertainty exists as to whether some wildlife, including species at risk, would be able to repopulate the local study area once reclamation is complete; and
- it is highly likely that these effects would occur since it is evident that most wildlife habitat within the local study area would be destroyed if the project proceeds.

For greater certainty, the Panel encourages good reclamation practices that will contribute to reducing the impact on species at risk and wildlife in general in the very long term. However, given the measures the governments of Alberta and Canada have taken to protect species at risk, the Panel cannot accept that the impacts of the project on species at risk over the next several decades are anything but significant. However, pursuant to Section 16 of the *Canadian Environmental Assessment Act*, the Panel is obliged to consider "measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the project." Such measures were presented during the hearing and the Panel is satisfied that some combination of these measures can be used to make the impacts to species at risk less than significant. If it's not possible to mitigate these impacts, the Panel would construe this outcome as a serious indicator that the project would not be in the public interest.

The Panel understands that AENV would need to issue an authorization under the *Environmental Protection and Enhancement Act* in order for the project to proceed. The Panel also understands that SRD provides advice to AENV regarding wildlife matters relevant to the authorization. Therefore, the Panel requires that TOTAL provide AENV with a wildlife mitigation plan for approval prior to clearing any vegetation and that this plan must achieve no net significant adverse effect to species at risk. As a precautionary approach, this plan should include species listed under the *Species at Risk Act* as well as the short-eared owl and species listed as "sensitive", "at risk", or "may be at risk" in the *General Status of Alberta Wild Species 2005*. The Panel expects that SRD, in consultation with EC and AENV, will determine the requirements necessary for the wildlife mitigation plan to achieve no net significant adverse effect to species at risk. While EC is not the regulatory authority in this instance, it possesses expertise regarding species at risk, especially those listed under the *Species at Risk Act*. This collaborative expertise would prove valuable in deciding on how effective the wildlife mitigation plan would be at reducing significant impacts on species at risk to a level that would result in no net significant adverse effects.

To achieve this, the wildlife mitigation plan's first priority should be to avoid impacts or reduce their magnitude where possible through mitigation measures such as using appropriate setbacks to avoid disturbing nests, reducing noise levels, and relocating individual animals. The second priority should be to create positive effects for the species at risk that would be sufficient to offset the residual impacts. To do this, measures such as creating and protecting habitats elsewhere and developing and implementing mitigation measures suitable for protecting species at risk could be implemented.

This new wildlife mitigation plan should include measures such as the following:

- implementation of off-site offsets: The creation (preferred) or the protection of habitats suitable for species at risk in locations relatively near the project;
- identification and avoidance of relevant high quality habitat for species at risk, especially along the Ells River using a setback distance suitable enough to reduce habitat loss. The Panel notes that EC provided setback requirements for federally listed birds and recommends that they be used;
- reduction of noise below 42 dBA at nesting locations;
- use of the *Environmental Assessment Best Practice Guide for Wildlife at Risk in Canada* which outlines the standards and expectations for reclamation and mitigation;
- relocation of affected species to reduce the number of individuals harmed. This would likely be effective for western toads in areas in which dewatering or land clearing activities are planned;
- collaboration with the Alberta Biodiversity Monitoring Institute; and
- conducting research on species at risk and disseminating the results to provide valuable information for TOTAL, other oil sands operators, and any species at risk recovery teams and enable more well-informed mitigation and adaptive environmental management.

The Panel notes that conducting research in and of itself is not a mitigation measure but is carried out to better understand the ecology of species at risk in order to develop mitigation measures and implement them using adaptive management practices.

The Panel notes that in order for the wildlife mitigation plan to achieve no net significant adverse effects on species at risk, an optimal combination of mitigation measures, such as those listed above, needs to be identified. As an evaluation of the proposed plan requires the expertise of SRD and EC, the Panel recommends that prior to any authorization of the project, SRD consult with EC as appropriate, and work with TOTAL to ensure that additional mitigation, such as using off-site offsets, avoiding high quality habitat, and conducting research, be identified to ensure that the project would not cause significant adverse effects to species at risk. These additional measures should be provided to AENV for inclusion in any *Environmental Protection and Enhancement Act* approval it may issue.

The Panel is of the view that the recommendation above would also be beneficial for valued wildlife since off-site offsets provide habitat for both valued wildlife and species at risk.

6.1.3.2 Valued Wildlife Species

The Panel notes that TOTAL determined that significant adverse effects would arise if the project results in long-term or irreversible loss of wildlife diversity within the regional study area and that it assigned significance ratings for the effects of the project within a regional context.[22]

The Panel notes that some interveners suggested that other more stringent thresholds would be more appropriate. For example, the Panel notes that Fort McKay suggested that the remaining habitat should be at least 80 per cent and Sierra Club Prairie suggested that 80 to 90 per cent habitat should remain to avoid significant effects to wildlife. The Panel notes that both Sierra Club Prairie and EC indicated that previous oil sands assessments used a threshold of 80 per cent remaining habitat and that OSEC disagreed with TOTAL's threshold of 60 per cent remaining habitat. The Panel notes that these parties provided no analysis to support their positions about the threshold.

The Panel understands that TOTAL provided an explicit reason for choosing a threshold of 60 per cent remaining habitat and argued that the evidence it reviewed suggested that species may decline more rapidly below certain thresholds of habitat than would be expected from habitat loss alone, which could lead to local extirpation if population drops too low. TOTAL noted that in the literature it reviewed, 30 per cent residual habitat was sufficient to avoid rapid declines in population. TOTAL therefore claimed that using 60 per cent residual habitat was precautionary. Others interveners claimed that much higher remaining habitat was more traditionally used and that 60 per cent would constitute a significant adverse impact.

Based on its assessment of the evidence, the Panel is of the view that using a 60 per cent threshold of remaining habitat for all assessed wildlife may not be sufficient to ensure that there would not be any significant effects on wildlife. The Panel also notes that it is unusual to use the regional study area for determining the significance of effects; the regional study area is more commonly used to assess cumulative effects whereas the local study area is normally used to assess the effects of a project. The Panel notes that TOTAL's evidence indicates that there would be a significant effect in the local study area during the operation of the project but that this effect would not be significant after reclamation. The Panel understands that TOTAL also indicated that the remaining habitat available in the regional study area would be able to sustain viable populations of wildlife species and concluded that there would not be any significant effects on valued wildlife from the project. The Panel concludes that the duration and magnitude of the effects of the project on the disturbed footprint of 7000 hectares would result in significant adverse effects to wildlife in the local study area; however, the mitigation measures recommended by the Panel for species at risk, especially the offsite offsets, would also mitigate the effects of the project on valued wildlife. Accordingly, the Panel requires that the new wildlife mitigation plan deal with mitigating impacts to not only species at risk, but also valued wildlife.

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[22] TOTAL applied a 60 per cent habitat remaining in the regional study area to determine significance of effects to wildlife within the local study area.

With respect to TOTAL's assessment of direct and indirect mortality for specific species of valued wildlife, the Panel finds that TOTAL did this assessment appropriately and agrees with TOTAL's conclusions.

6.1.3.3 Wildlife Corridors

The Panel notes that TOTAL's evidence concluded that the project's footprint would limit the movement of bear and moose in the local study area. The Panel is of the view that wildlife corridors are important to maintain habitat connectivity for wildlife in the region. The Panel notes that there is uncertainty about an appropriate mine development setback from the Ells River to allow a wildlife corridor around the project and that there is uncertainty with using the Ells River valley as a wildlife corridor. The Panel agrees with EC that the need for a wildlife travel corridor may become more important over time as development of the area intensifies. The Panel notes that any existing studies on wildlife corridors in the mineable oil sands area or in other areas may help identify what the appropriate width of the corridor along the Ells River valley should be. The Panel concludes that more studies of the local study area and the regional study area are needed before a final conclusion can be drawn; however, a precautionary approach should be adopted in the establishment of wildlife corridors until such studies can be conducted and evaluated.

The Panel further notes SRD's request that the Panel's decision should clearly define required setbacks or indicate that SRD should determine the required setbacks. The Panel finds that SRD is the most appropriate governing body able to determine the required setbacks of the project from the Athabasca River and the Ells River valley for wildlife movement. The ERCB's responsibilities include the conservation and prevention of the waste of Alberta's oil sands resources and to ensure that development occurs in an economic, orderly, and efficient manner that is in the public interest. In determining if a project is in the public interest, the legislation requires that the Panel have regard for, among other things, its effect on the environment. In terms of the wildlife corridor, there is a need to ensure that the setback is sufficient for use by wildlife. However, the greater the setback, the more bitumen would be sterilized; therefore, a trade-off exists between resource sterilization and the need for a wildlife corridor. The Panel recommends that the ERCB and SRD cooperate to provide an assessment of the implications of resource sterilization to help SRD in determining the most appropriate setback of the project from the Ells River.

The Panel recommends that the ERCB and SRD, in consultation with EC as appropriate, determine the appropriate mine development setbacks from the Athabasca River and the crest of the Ells River valley to ensure effective wildlife corridors and provide these setbacks to AENV to include in any *Environmental Protection and Enhancement Act* approval it may issue.

6.1.3.4 Waterfowl and Tailings Ponds Interactions

The Panel notes that TOTAL did not assess the impacts of the project on waterfowl as a result of interactions with process-affected water but that, at the request of the Panel, it provided data from other oil sands operators on bird recoveries in tailings ponds and the deterrent systems being used. The Panel would like to ensure that mitigation measures to deter birds from landing in tailings ponds continue to be researched and improved in the oil sands region. This will be necessary in order to reduce the impacts of the proposed project on waterfowl. In this regard, the Panel notes TOTAL's commitment to participate in the Oil Sands Wildlife Protection Committee and bird deterrent monitoring program and expects that TOTAL would implement the best available bird deterrent practices and technologies to reduce waterfowl/tailings pond interactions.

6.1.3.5 Conclusion

The Panel is of the view that the significant adverse effects of the project on species at risk and valued wildlife must be mitigated by a combination of the mitigation measures listed and the recommendations and conditions provided in this section. The Panel recommended that additional mitigation measures be implemented and believes that AENV and SRD should consult with EC, as appropriate, to determine the best combination of measures necessary to achieve a no net significant adverse effect on species at risk and valued wildlife. The Panel is of the view that the effects of the project would be sufficiently reduced if such measures are implemented and that significant adverse effects on species at risk and valued wildlife would not result. The Panel discusses the project's contribution to cumulative effects to valued wildlife and species at risk in Section 7.2.

The Panel is of the view that proper follow-up monitoring is required so that TOTAL can determine the effectiveness of reclamation and if species are re-establishing themselves in the local study area. If wildlife that currently resides in the local study area do not return to the site in a timely manner, then further adaptive management measures would be required to ensure the area is not only reclaimed, but also functions as wildlife habitat. The Panel recommends that AENV and SRD, with advice from EC as appropriate, determine what combination of monitoring and follow-up measures TOTAL or CEMA should conduct and, based on the results of such work, implement adaptive management measures as are necessary.

6.2 Vegetation and Wetlands

6.2.1 Views of TOTAL

TOTAL predicted that the project would result in the direct loss of about 7000 hectares of vegetation and wetlands from surface disturbance due to clearing and mining activities. However, TOTAL also noted that with progressive reclamation, a maximum of 5000 hectares would be disturbed at any point in time.

TOTAL assessed the following 10 vegetation and wetland indicators:

- old growth forests,
- ecosite phases[23] of restricted distribution,[24]
- Alberta Wetland Inventory[25] wetland classes of restricted distribution[26]
- ecosite phases supporting traditional use plants,
- Jack pine communities,
- plant communities of conservation concern,
- rare plants,
- rare plant potential,
- vegetation communities sensitive to potential acid input, and
- vegetation communities sensitive to nitrogen distribution.

Table 5 summarizes TOTAL's predicted changes to selected vegetation indicators.

Table 5. Predicted change to selected vegetation valued ecosystem components in the local study area[27]

Valued ecosystem components	Baseline case (hectare)	Project at full build-out (hectare)	Project at full build-out compared to baseline (%)	Project at closure (hectare)	Project at closure compared to baseline (%)
Old growth forests	305	197	-35	197	-35
Ecosite phases of restricted distribution	240	93	-61	3493	1455
AWI wetland classes of restricted distribution	552	88	-84	181	-67
Ecosite phases supporting traditional-use plants	6002	2217	-63	5633	-6
Jack pine communities	176	9	-95	9	-95
Rare plant potential	704	195	-72	287	-59

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[23] Ecosite phases are an ecological classification system developed for Northern Alberta through analysis of vegetation, soil, site, and forest productivity information.

[24] Ecosite phases of restricted distribution were defined by TOTAL as those ecosite phases occupying less than 1 per cent each of the local study area.

[25] The Alberta Wetland Inventory is a wetland classification system developed for Alberta based on drainage patterns, hydrological regime, and soil characteristics.

[26] TOTAL defined wetland classes of restricted distribution as those occupying less than 1 per cent each of the local study area. Wetland classes of restricted distribution totalled about 3 per cent of the local study area.

[27] Adapted from Table K4-1; Hearing exhibit 001-043

Of the vegetation indicators assessed, TOTAL determined that there would be significant adverse effects to those listed in Table 5 at the local level during mining operations.

TOTAL also assessed the potential effects on vegetation indicators in the regional study area (Table 6). Overall, TOTAL determined that there would be no residual effects at the regional level on any of the indicators following reclamation programs and activities undertaken by it and other operators in the mineable oil sands area. It therefore deemed the regional effects on vegetation and wetlands to be insignificant.

Table 6. Predicted change to selected vegetation valued ecosystem components in the regional study area[28]

Valued ecosystem components	Baseline case (hectare)	Project at full build-out (hectare)	Project at full build-out compared to baseline (%)	Planned development case (hectare)	Planned development case compared to baseline (%) (no reclamation)
Old-growth forests	24 334	24 226	-0.5	20 780	-15
Ecosite phases of restricted distribution	20 064	19 918	-0.7	18 775	-7
Ecosite phases supporting traditional-use plants	260 408	256 623	-1.5	233 736	-10
Jack pine communities	6988	6821	-2.4	6109	-13
Rare plant potential	21 208	20 699	-2.4	18 424	-13

In addition, TOTAL assessed potential effects on vegetation by calculating the net loss and/or gain of upland and lowland ecosite phases at both the local and regional levels. TOTAL described upland ecosites as areas of forest or other vegetative cover, and lowland ecosites as mainly wetlands in the form of bogs, fens, swamps, and marshes. The assessment compared four time periods: pre-industrial baseline case (1965), baseline case, application case, and the planned development case.

Should the project proceed, TOTAL estimated that there would be a net gain of 4140 hectares (+88 per cent) of upland ecosites and a net loss of 2283 hectares (-72 per cent) of lowland ecosites compared to the baseline case at the local level. It estimated that a net amount of 21 555 hectares (-5 per cent of regional study area) of upland and 13 989 hectares (-3 per cent of regional study area) of lowland ecosite phases would be lost in the region relative to the baseline case should all projects included in the assessment proceed as proposed, not taking reclamation into account.

TOTAL proposed several measures that could be implemented to lessen or avoid effects on vegetation and wetlands in the project area, including

- using previously disturbed areas where possible;
- accommodating multiple-use areas, such as roads, pipelines, and powerlines; and

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[28] Adapted from Table K4-2; Hearing exhibit 001-043

- undertaking progressive reclamation and revegetation.

TOTAL stated that wetlands and peat lands provide a number of essential ecosystem functions. It said that wetlands support high biodiversity, provide high-quality wildlife habitat, control flooding, and filter water. TOTAL estimated that wetlands and peat lands occupied about 27 per cent of the local study area at baseline and that the project would eliminate a net area of about 2330 hectares (74 per cent) of wetlands compared to baseline following closure and reclamation.

Most of the wetlands that would be lost are peat-accumulating wetlands. TOTAL noted that peat-accumulating wetlands have not been demonstrated to be successfully reclaimed using current technology; therefore, the loss of peat lands may be irreversible. TOTAL stated that it considered the project's effects on wetlands at the local level to be significant; however, it predicted negligible effects at the regional level as wetlands are common throughout the region and are expected to persist.

To compensate for the loss of peat-accumulating wetlands, TOTAL stated that it intended to experiment with peat land reclamation technology, including pilot studies on the Joslyn lease. Moreover, it indicated that it had incorporated a number of measures that could help various wetlands evolve in the post-closure landscape. It also indicated that it would continue to participate in regional wetland research initiatives (Section 10) as well as two terrestrial offset initiatives: one is the purchase of 56 hectares of private boreal forest land in partnership with the Alberta Conservation Association; the other involves additional terrestrial offsets, in consultation with the Alberta Conservation Association, that could include restoring wetlands and researching the success of developing restored wetlands into functioning ecosystems.

TOTAL and the community of Fort McKay—including the Fort McKay First Nation and Métis Nation Local # 63—also reached an agreement that included numerous commitments by TOTAL to offset the potential negative effects of the project on Fort McKay.

TOTAL stated that it would comply with regulations and policy for wetland management if they were implemented after project approval and that it would assess the project's mine plan for areas that could be redesigned for the development of additional wetlands.

6.2.2 Views of Interveners

Concerns raised by the participants relative to vegetation and wetlands focused largely on issues related to plants used for traditional activities and peat-accumulating wetlands or muskeg.

Mikisew Cree First Nation (Untested Evidence)

MCFN argued, in written submission, that the project's effect on several plants that supported traditional activities could not be mitigated; therefore, the Panel should recognize the predicted effects as significant.

Fort McKay First Nation and Métis Nation Local # 63 (Untested Evidence)

Fort McKay, in written submission, expressed concern over the loss of wetlands and rare plants and over TOTAL's proposed change to the landscape from predominantly lowlands to predominantly uplands in the post-closure landscape of the local study area. Fort McKay was concerned that TOTAL was not proposing to reclaim a diverse set of lowlands or wetlands. Fort McKay also noted that muskeg was integral to their culture and supported many valued traditional plants. Fort McKay noted that reclamation measures are not technically feasible for many plants that support traditional activities, and that it believed that the project would have a significant adverse effect on ecosite phases supporting traditional use. Lastly, Fort McKay members were concerned about the loss of the Jack pine area within the Joslyn lease. It stated that the Jack pine area was an important area for gathering berries and medicine, hunting, and camping.

Oil Sands Environmental Coalition

OSEC stated that wetlands provide many valuable ecological and social services. It noted the ability of wetlands to contribute to healthy aquatic watersheds and to sequester carbon naturally. OSEC argued that the project would cause an irreversible loss of peat lands within the project area as no reclamation techniques currently exist to re-establish them. Furthermore, OSEC noted concern for Alberta Wetland Inventory classes of restricted distribution as TOTAL predicted that there would be a 31 per cent residual loss of wetlands after reclamation. Regionally, OSEC was concerned that should this project and all other current and future projects proceed as proposed, the Joslyn mine would contribute to the destruction of over half of the wetlands in the oil sands surface mineable area. OSEC was of the view that the loss of wetlands—and particularly peat lands—should be considered a significant adverse environmental effect at both the local and regional levels.

Furthermore, OSEC argued that TOTAL's proposed terrestrial offset mitigation strategy was insufficient to compensate for the loss of wetlands. OSEC indicated that in the past, TOTAL had aimed for a one-to-one terrestrial offset ratio for its proposed steam assisted gravity drainage Phase III project through the acquisition and conservation of private boreal forest lands. OSEC submitted that TOTAL should consider the same, if not a larger, ratio for this project to compensate for the fact that recreated wetlands do not provide the same ecological value as natural wetlands. OSEC also suggested other methods to compensate for the loss of vegetation and wetlands, such as negotiating with forestry companies to retire part of their annual allowable cut, or restoring private or public lands. OSEC supported the Government of Alberta's Water for Life strategy and indicated that a provincial wetland policy should be implemented to protect and manage Alberta's wetlands.

Mike Guertin

Mr. Guertin noted the importance of muskeg for cleaning water and was concerned that because of its complexity there was no way to mitigate its loss. Mr. Guertin expressed concern that the project would disrupt the regional flow of water to the muskeg in the region. Mr. Guertin indicated that to his knowledge, water flows north and east from the Birch Mountains to Wood Buffalo National Park. Mr. Guertin was of the view that the project would impede flow to the muskeg north of the proposed mine.

Government of Canada

EC supported TOTAL's commitment to experiment with the reclamation of peat lands and noted that the planned experimentation is aligned with the objectives of the Federal Policy on Wetland

Conservation. EC asked that the Panel recommend that TOTAL continue to experiment with reclamation of peat-accumulating wetlands and report its results publically for the benefit of reclamation science in the region. EC noted that the longevity of the proposed project offered a significant opportunity in that regard.

6.2.3 Panel Conclusions and Recommendations

The Panel agrees with both TOTAL and interveners that wetlands have an important role in ecosystem function, including biodiversity support, flood control, water filtration, and carbon sequestration.

The nature of an open-pit mine leads the Panel to agree with TOTAL that there would be adverse effects on a number of vegetation indicators at the local level. The Panel understands that the effects may last for many decades until vegetative communities could re-establish. The Panel, however, is aware of TOTAL's commitment to conduct progressive reclamation, limiting the total disturbed project footprint to no more than about 5000 hectares and initiating a suite of other mitigation measures consistent with regulatory approvals. The Panel is prepared to accept TOTAL's commitments to reclaim the landscape with conditions and recommendations (Section 10). Moreover, the Panel expects that the additional offsets and mitigation measures required to ameliorate effects on wildlife should include lands that would properly constitute offsets for vegetation and, especially, for wetlands (Section 6.1.3).

In making its determination on wetlands, the Panel considered TOTAL's commitment to promote the development of a diverse set of wetlands on the post-closure landscape surrounding the pit and compensation lakes, riparian zones, and ephemeral and vegetated waterways. The Panel also considered TOTAL's commitment to identify opportunities for on-site pilot studies on peat-accumulating wetlands establishment. The Panel is of the view that experimentation and research on the reclamation of wetlands—and in particular peat-accumulating wetlands—is necessary to contribute to the scientific knowledge of, and ultimately to the long-term environmental management of, the surface mineable oil sands region. The Panel agrees with EC that given the 40-plus years proposed for the project, there is an opportunity to advance the scientific knowledge and operational practice for peat-accumulating wetlands that should be shared with the public and other operators in the mineable oil sands area. Should the project proceed, the Panel recommends that TOTAL develop and submit a detailed plan to AENV, in consultation with EC as appropriate, and to SRD for review and approval, outlining its explicit plans to experiment with peat land and reclaim wetland before the project begins. AENV should also require that TOTAL develop a follow-up and monitoring program in consultation with SRD and EC, as appropriate, to determine the success of reclaimed wetlands.

The Panel notes the concerns of interveners with respect to the transformation of the landscape from predominantly lowlands to predominantly uplands in the post-closure landscape. As the Panel understands it, there would be a net addition of uplands to the post-closure landscape and a net loss of lowlands relative to the baseline case for the local study area. The Panel also observes the regional cumulative effects assessment carried out by TOTAL with respect to vegetation and wetlands. While the loss of lowlands cannot be fully avoided, the Panel is of the opinion that in the long term, the project site can be reclaimed with other valued self-sustaining ecosystems, including wetlands.

With respect to vegetation used for traditional activities, the Panel cannot give the submitted written evidence much weight because it was neither presented nor tested at the public hearing. The Panel observes that Fort McKay, MCFN, and ACFN all withdrew their objections to the project. The Panel infers that no further concerns exist.

The Panel notes that the Government of Alberta is currently developing a wetland management policy. The Panel supports the Province in implementing such a policy.

The Panel concludes that the project, taking into account the implementation of the proposed mitigation measures, would not significantly and adversely affect wetlands or vegetation.

6.3 Water

6.3.1 Hydrology

6.3.1.1 Views of TOTAL

TOTAL stated that the annual volume of water required for this project would meet the needs of the bitumen extraction processes and other project requirements. TOTAL would use fresh water to replace the water lost to tailings streams and evaporation from ponds. Proposed water sources included the Athabasca River, site precipitation runoff, and seepage collected in the closed-circuit drainage system.

TOTAL estimated a maximum water requirement of 26.4 million cubic metres during 2018. To meet this need, TOTAL indicated that it would withdraw a maximum annual volume of 22 million cubic metres from the Athabasca River. The on-site runoff water collection system would provide the additional 4.4 million cubic metres required (Section 7.3 provides further discussion on water withdrawal from the Athabasca River).

TOTAL indicated that the flows of Joslyn Creek and Tributary 5 (Figure 3) would be permanently diverted from the project development area into a constructed 26.5-hectare wetland. TOTAL added that the wetland outflow and the Ells River Tributary 4 flows would converge and discharge into an 85.8-hectare compensation lake. TOTAL stated that the compensation lake would discharge through the existing route of Tributary 4 into the Ells River.

TOTAL stated that the design of the Joslyn Creek realignment system would meet probable maximum flood conditions and regulatory closure standards before bitumen extraction began. TOTAL indicated that it would design and construct wetlands according to the *Guideline for Wetland Establishment on Reclaimed Oil Sands Leases*[29] and applicable reclamation certification guidelines. Both the wetland and the compensation lake would have sustainable shorelines and would accommodate geomorphic changes and erosion during flood events over the long term. TOTAL noted that the proposed wetland and channel improvements would protect the compensation lake, Tributary 4, and the Ells River from potential flooding, erosion, and sedimentation.

TOTAL asserted that it expected a reduction in the mean annual flow at the mouth of Joslyn Creek as a result of the end pit lake construction after mine closure and in the future. TOTAL predicted a

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[29] *CEMA* 2007, revised second edition.

1.5 per cent increase in the mean annual flow at the mouth of the Ells River for the application case compared to the baseline case. TOTAL concluded that there would be insignificant changes in stream flows in Joslyn Creek and the Ells River as result of the project.

TOTAL stated that the project's surface water management plan contains design features, mitigation measures, and best management practices to minimize changes in hydrology parameters, including

- distributing muskeg drainage and overburden dewatering over the project's life,
- minimizing sediment loading to receiving streams by routing drainage and dewatering flows to release-water ponds,
- minimizing the effects of closed-circuit operations by diverting undisturbed natural streams to receiving watercourses, and
- minimizing water withdrawal requirements from the Athabasca River by consolidating tailings pore-water and directing closed-circuit water to the extraction process.

TOTAL, based on the predictions in the cumulative assessment, concluded that any changes in hydrology parameters resulting from the project, in combination with existing and planned developments, were insignificant.

6.3.1.2 Panel Conclusions and Recommendations

The Panel addresses water withdrawal from the Athabasca River in Section 7.2.

The Panel recognizes TOTAL's plans to manage undisturbed surface water and minimize water withdrawal requirements from the Athabasca River by consolidating tailings porewater and directing closed-circuit water to the extraction process. Based on TOTAL's proposed surface water management plans, the Panel concludes that even with the diversion of Joslyn Creek, the effects of the project on the hydrology of the project area would be negligible.

6.3.2 Water Quality

6.3.2.1 Views of TOTAL

TOTAL stated that it would collect and reuse all process-affected waters from its operations in a closed-circuit drainage system. Sources of process-affected water include surface-water runoff and seepage waters from process-affected water ponds, dedicated disposal areas, sand beach areas, external disposal areas, mine pit, extraction and ore processing plant sites, and reclamation material stockpiles.

TOTAL indicated that it would separate water planned for release from process-affected water to reduce potential effects on water quality of receiving streams. TOTAL stated that water suitable for release would flow through a release-water pond prior to discharge into the Ells River. TOTAL defined waters suitable for release as surface-water runoff from the natural catchment area diverted by perimeter ditches along the north side of the mine pit and water from dewatering sumps that intercept seepage from the surficial aquifer and drainage from muskeg areas.

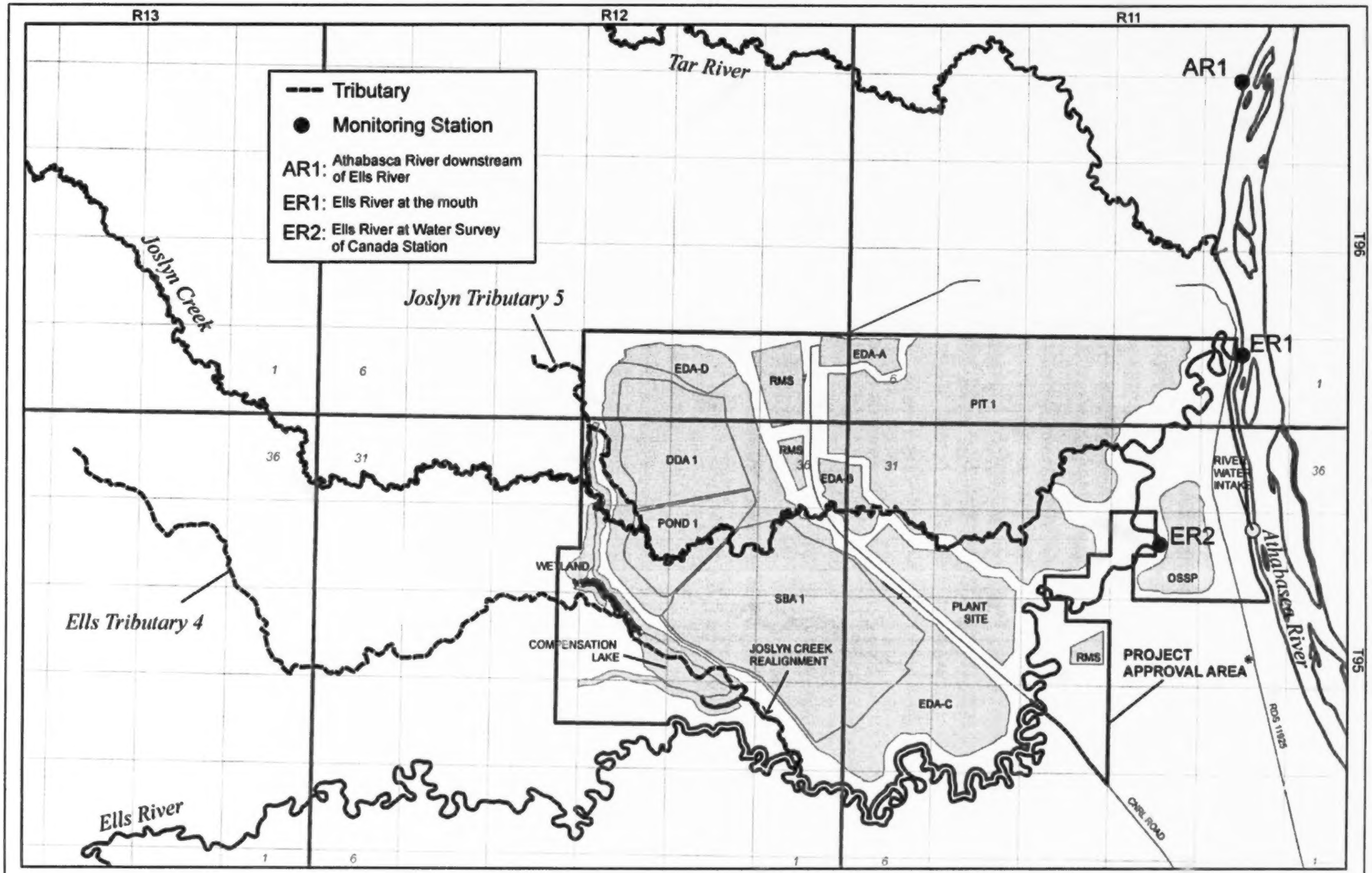
R13
R12
R11
Tar River
Tributary
Monitoring Station
AR1: Athabasca River downstream of Ells River
ER1: Ells River at the mouth
ER2: Ells River at Water Survey of Canada Station
AR1
Joslyn Creek
Joslyn Tributary 5
T96
T95
ER1
ER2
EDA-D
RMS
EDA-A
PIT 1
DDA 1
RMS
EDA-B
POND 1
RIVER WATER INTAKE
OSSP
WETLAND
SBA 1
PLANT SITE
COMPENSATION LAKE
JOSLYN CREEK REALIGNMENT
EDA-C
RMS
PROJECT APPROVAL AREA*
Athabasca River
Ells Tributary 4
Ells River
CNRL ROAD
RDS 11925
1
6
36
31
36
31
1
36
1
6
1
6
1
N
0 1 2 4 Kilometres

FIGURE 3

TRIBUTARIES AND MONITORING STATIONS
JOSLYN NORTH MINE PROJECT

DDA	Dedicated Disposal Area
EDA	External Disposal Area
OSSP	Off Stream Storage Pond
RMS	Reclamation Material Stockpile
SBA	Sand Beach Area

* Approval area setbacks from the Ells River and Athabasca River are subject to adjustments as discussed in the recommendations outlined in this report.

TOTAL stated that near the end of mining operations, estimated to be in the year 2036, it would locate perimeter ditches on the north, east, and south sides of the mine pit. TOTAL would route the water collected in these ditches and the mine pit into process-affected water pond 2, and ultimately to the proposed end pit lake.

TOTAL indicated that it used the Hydrologic Simulation Program FORTRAN model to predict water quality in Joslyn Creek, the Ells River, and the Athabasca River. TOTAL used a combination of three models to predict water quality in the end pit lake: Hydrologic Simulation Program FORTRAN, a two dimensional hydrodynamic and water quality model, CE-QUAL-W2, and the Golder Pit Lake Model. TOTAL stated that it calibrated these models based on updated stream flow predictions and additional background water quality data. For the environmental impact assessment, TOTAL used water quality guidelines developed by AENV, the Canadian Council of Ministers of the Environment, and the U. S. Environmental Protection Agency.

TOTAL stated that the Regional Aquatics Monitoring Program (RAMP), a science-based and results-focused environmental monitoring program, determines, evaluates, and communicates the state of the aquatic environment and any changes that may result from cumulative resource development in the oil sands region. TOTAL indicated that it used 2004–2009 RAMP data in the assessment of environmental impacts of the project, and that no evidence suggested that RAMP data were unreliable. In response to concerns raised with respect to RAMP's effectiveness, TOTAL indicated that both the federal and provincial governments have assigned independent panels to review the region's water management regime.

TOTAL stated that the Panel should give no weight to the powerpoint presentation submitted by the MCFN regarding fish deformities or to the Kelly et al. paper. TOTAL argued that the data underlying these reports was not provided and there was much disagreement over the credibility of the reports.

TOTAL asserted that several constituents in Joslyn Creek naturally exceeded water quality guidelines. In the application case, TOTAL indicated that discharges from muskeg drainage, overburden dewatering, and the proposed realignment would affect Joslyn Creek's water quality. TOTAL stated that mine-related seepage would not reach the Joslyn Creek realignment during any stage of mining or in the far future.

TOTAL predicted concentrations of all constituents in Joslyn Creek to be within baseline case levels, with decreased peaks due to water retention in the compensation lake. It predicted chronic and acute toxicity to be zero, as TOTAL did not expect process-affected water to reach Joslyn Creek or the Joslyn Creek realignment. TOTAL concluded that predicted changes to water quality and effects on aquatic health in Joslyn Creek and the Joslyn Creek realignment resulting from the project would be insignificant.

TOTAL stated that several constituents of concern naturally exceeded water quality guidelines for the Ells River. TOTAL predicted that all of these constituents would remain below chronic effects benchmarks. TOTAL stated that in the application case, water quality in the Ells River may be affected by discharges from muskeg drainage and overburden dewatering, changes to the watershed from closed-circuiting and realignment of tributaries, releases from the project's pit lake, and potentially by a negligible seepage rate of 0.00005 cubic metres per second from disturbed areas in the far future.

TOTAL stated that in 2044 and in the far future, release from the pit lake would increase median and peak concentrations of several constituents in the Ells River but would remain below chronic effects benchmarks. Predicted concentrations of labile and refractory naphthenic acids, total dissolved solids, and other constituents would increase relative to the baseline case concentrations. TOTAL also predicted that labile naphthenic acids would be a small portion of the total naphthenic acids. The majority of naphthenic acids, the refractory fraction, would be less toxic. It anticipated the effects to be negligible as the simulated whole-effluent toxicity was below provincial thresholds for acute and chronic effects to aquatic life.

TOTAL indicated that it would implement a water quality monitoring program, approved by AENV, before initiating construction. The program would continue throughout the life of the project and would detect changes in water quality, enabling TOTAL to ensure compliance with regulatory requirements potentially included in an anticipated *Environmental Protection and Enhancement Act* approval.

TOTAL considered the effects on aquatic biota in the lower Ells River as a result of the predicted changes in major ions, total dissolved solids, sulphate, and peak total nitrogen to be insignificant. Based on modelling, TOTAL estimated that seepage would result in negligible changes to existing concentrations of constituents of concern in the Ells River and that predicted chronic and acute toxicity would be close to zero. TOTAL concluded that impacts to water quality and aquatic biota in the lower Ells River resulting from the project would be insignificant.

TOTAL committed to

- consider in the emergency response plan events that could adversely affect the quality of the Ells River. The plan would include instructions to communicate immediately with groups and individuals that could be impacted by an event affecting water quality of the Ells River, such as drinking water treatment facilities; any work camps, and residents whose drinking water comes from a source other than a drinking water treatment facility.
- provide alternative supply sources of fresh water if Fort McKay determines it requires an alternative to its current supply from the Ells River.

6.3.2.2 Views of Interveners

Non-Status Fort McMurray Descendants and Clearwater River Band

These groups expressed concerns about the water quality of Joslyn Creek and the Ells River and stated that TOTAL did not properly consider the concerns for effects on the community. They were concerned with the inconsistency in water quality data reported by TOTAL and the data from other scientific sources.

Oil Sands Environmental Coalition and Sierra Club Prairie

OSEC and Sierra Club Prairie stated that they agreed to jointly retain and tender the expert evidence of Dr. William F. Donahue for the assessment of water quality, sediment quality, benthic invertebrates, and hydrology of the project.

OSEC stated that the project, combined with existing, approved, and planned developments, would result in a decline in the quality of regional waters due to the release, deposition, and accumulation of organics, heavy metals, and other pollutants. OSEC and Sierra Club Prairie stated that TOTAL did not consider peer-reviewed scientific literature regarding the effects of oil sands development on water quality[30]; instead, TOTAL depended on RAMP and CEMA reports and guidelines for the assessment of impacts and the design of the corresponding mitigation and monitoring plans.

OSEC and Sierra Club Prairie stated that TOTAL based most of its conclusions related to surface water issues on RAMP's 2004 technical report. OSEC and Sierra Club Prairie stated that, in 2004, an independent scientific review criticized RAMP for not satisfying its goals to characterize existing variability, detect regional trends and cumulative effects, and monitor to verify environmental impact assessment predictions.

OSEC and Sierra Club Prairie stated that TOTAL used analytical detection limits for contaminants that exceeded guideline concentration limits or relevant environmental concentrations. OSEC and Sierra Club Prairie indicated that by using these analytical techniques, TOTAL concluded that there was no evidence of these compounds in surface waters or that there was no change in their concentrations; OSEC and Sierra Club Prairie disagreed with TOTAL's conclusion.

OSEC and Sierra Club Prairie stated that TOTAL sampled the local study area and regional study area for a number of heavy metals in surface waters and that TOTAL interpreted these concentrations according to percentages of guideline exceedances, distribution of concentrations, and seasonal patterns, if evident. OSEC and Sierra Club Prairie indicated that TOTAL did not complete any spatial analysis regarding the proximity to oil sands development and the effect on water quality. For this reason, OSEC and Sierra Club Prairie concluded that TOTAL's assessment on the effects of heavy metal deposition and emissions from oil sands operations was incomplete. In addition, OSEC and Sierra Club Prairie suggested that TOTAL's statement that no evidence of adverse impacts from oil sands operations on local or regional water quality existed was incorrect.

OSEC and Sierra Club Prairie stated that TOTAL predicted an 11 to 12 per cent increase in the peak annual flow of the Ells River, with an approximate widening of the river channel of less than one metre, no increase in sediment transport, and a decrease in total suspended solids in the river. OSEC and Sierra Club Prairie stated that TOTAL's conclusion was incorrect, considering that an increase in both the width of the channel and the flows would increase suspended sediments in the Ells River.

Government of Canada

EC stated that it was aware of TOTAL's commitment to support and participate in RAMP. EC recognized the work performed by RAMP and stated that it supported RAMP's ongoing enhancement as a component of a regional integrated environmental monitoring approach.

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[30] The papers referred to by OSEC and Sierra Club Prairie are: Ayles, G.B., M. Dubé, and D. Rosenberg. 2004. Oil Sands Regional Aquatic Monitoring Program (RAMP) Scientific Peer Review of the Five Year Report (1997-2001); Kelly, E.N., *et al*. 2009. Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries. *Proceedings of the National Academy of Sciences*; Kelly, D.J., *et al*. (In Press). Oil sands development contributes toxic concentrations of elements to the Athabasca River and its tributaries. *Proceedings of the National Academy of Sciences*.

EC highlighted the importance of continuously monitoring all sources and pathways of contaminants in all the disposal areas, camp wastewater discharges, and the end pit lake. EC stated that data would be essential for updating and refining water quality models, and to demonstrate compliance with provincial and federal regulations and requirements.

EC recommended that TOTAL develop a site-specific water and sediment quality monitoring program with its mitigation plan. EC also recommended that TOTAL develop a groundwater monitoring program to measure the discharge rates of contaminants to surface water and prepare appropriate plans to reduce the concentration of pollutants to predevelopment levels. EC recommended that the surface water, sediments, and groundwater monitoring data be available for peer review on a public Web site.

EC stated that TOTAL's approach used to set chronic effects benchmarks is not consistent with recent developments. EC recommended that TOTAL support the investigation and development of site-specific water quality objectives, according to Canadian Council of Ministers of the Environment protocols, for substances of concern without published guidelines.

NRCan stated that TOTAL did not develop a plan for monitoring and treating process-affected water in the tailings disposal structures. NRCan stated that seepage from those structures may reach the groundwater system and surface water features such as the Ells River. NRCan recommended that TOTAL provide a contingency plan for treatment of process-affected water if, after decommissioning, water quality were lower than predicted.

HC stated that TOTAL had addressed its concerns related to drinking water. HC said that the values used by TOTAL for drinking water ingestion in the human exposure estimates model are different and less conservative than those used by HC. However, HC stated that if TOTAL used HC's values, the overall change in the modelling outcome would have been negligible. HC recommended that future environmental assessments use HC's values for drinking water. HC recommended that in the emergency response plans, TOTAL consider events that could adversely affect the water quality of the Ells River and indicated that these plans should provide instructions for immediate communication with Ells River users if an event adversely impacts the river water quality.

6.3.2.3 Panel Conclusions and Recommendation

The Panel acknowledges OSEC's and Sierra Club Prairie's concerns regarding TOTAL's sole reliance on RAMP and CEMA for assessing the impacts of pollutants from the project on the environment, disregarding recent scientific reports that consider spatial analysis with respect to the proximity of oil sands development and the effects on water and sediment quality.

The Panel recognizes that the Ells River is an important tributary of the Athabasca River and that it is a source of drinking water. The Panel agrees with HC's recommendation that TOTAL should provide emergency response plans to promptly detect any deterioration of water quality in the Ells River and immediately communicate instructions to Ells River users.

The Panel acknowledges EC's recommendation regarding TOTAL's participation in the development of water quality objectives. The Panel recommends that the federal and provincial governments work with the Canadian Council of Ministers of the Environment to develop specific water quality objectives for naphthenic acids.

The Panel acknowledges TOTAL's plan to manage and reuse process-affected water in a closed-circuit drainage system during operations, preventing discharges into the environment and minimizing potential effects on the receiving streams. The Panel also recognizes TOTAL's plan to manage waters suitable for release by diverting them into the Ells River. The Panel acknowledges TOTAL's proposed interception system to capture seepage from operation areas, preventing detrimental effects in groundwater and surface water quality. The Panel expects TOTAL to implement the proposed water management plans, in compliance with AENV requirements, should the project proceed.

The Panel acknowledges that, for assessing effect of the project on surface water, TOTAL used current modelling programs; federal, provincial, and international water quality guidelines; chronic effects benchmarks; CEMA's guidelines; and RAMP's 2004–2009 reports. The Panel acknowledges that both Canada and Alberta have appointed advisory panels to document, review, and assess current monitoring data and methodologies and identify strengths and weaknesses of current water monitoring processes.

The Panel acknowledges that TOTAL has committed to consider in the emergency response plan events that could adversely affect the quality of the Ells River and that TOTAL would provide alternative sources of fresh water if Fort McKay determined it requires such an alternative supply.

The Panel also acknowledges that TOTAL would design and implement a water quality monitoring program throughout the life of the project in compliance with AENV requirements. The Panel expects TOTAL to implement the above commitments and the water quality monitoring program should the project proceed. In addition, the Panel notes that the work of the panels appointed by the provincial and federal governments may result in additional monitoring requirements.

The Panel is of the view that TOTAL's plan to manage surface and process-affected waters would help to prevent potential adverse effects on the receiving streams. The Panel concludes that taking into account

- TOTAL's commitments
- the implementation of a comprehensive water quality monitoring and surface water management plan in compliance with AENV regulatory requirements, and
- the Panel's recommendation and expectations outlined above,

the project is unlikely to result in significant adverse environmental effects on the water quality of the project area.

6.3.3 Groundwater

6.3.3.1 Views of TOTAL

TOTAL indicated that its groundwater resource assessment considered the immediate site specific effects related to drawdown in the quaternary aquifers, changes to basal water sands, potential changes to groundwater quality, and potential regional effects. Overall, this assessment predicted that changes to groundwater at the local level can be managed and mitigated and that there would be no regional effects from the project. Further, TOTAL submitted that with respect to groundwater, the cumulative effects assessment predicted that the effects of the project, combined with other developments, would not be significant.

TOTAL maintained that extensive geologic data obtained from the site indicated that it is underlain by a low-permeability till and glaciolacustrine clay that would limit seepage and naturally attenuate any seepage from mining and tailing structures, thus mitigating impact to groundwater resources. TOTAL acknowledged that uncertainties exist with groundwater modeling; however, it believed its current model was as predictive as possible and confirmed that the model would be updated and revised as new information became available over the life of the mine. TOTAL also committed to submitting an annual report on the seepage of process-affected water and mitigation efforts.

TOTAL committed to the development and implementation of a comprehensive groundwater monitoring and management plan and noted that the details of the monitoring program would be provided subject to the requirements of any forthcoming *Environmental Protection and Enhancement Act* approval. TOTAL stated that the requirements of a future *Environmental Protection and Enhancement Act* approval would include monitoring in areas where seepage could occur and to assess potential changes in groundwater quality at lease boundaries, including the Ells River valley. As a courtesy, TOTAL also offered to submit this groundwater monitoring plan to NRCan to confirm that a robust system would be in place to address the concerns that this department raised at the hearing.

Additionally, TOTAL underscored the requirement to support Alberta groundwater initiatives and follow the requirements set out in the AENV Groundwater Management Framework for the Northern Athabasca Oil Sands Region.

TOTAL also noted that its investigations have provided detailed information on the thickness and distribution of the Basal Water Sand deposits which it would dewater in proximity to the mine pit, with this water reinjected into the Basal Water Sand in the southwest portion of the lease. TOTAL described the Basal Water Sand deposits across the lease as occurring in hydraulically isolated pods of restricted volume with no hydraulic connection to surface water bodies, including the Athabasca River. TOTAL committed to gathering additional data, as mining progresses to the east, to further confirm that the Basal Water Sand is not connected to the Athabasca River.

TOTAL submitted that its assessment showed that dewatering or pressurization of these ponds could be managed or mitigated at the local level and that it had not predicted regional effects. TOTAL noted that deeper Devonian-aged disposal zones are not present in the project area.

TOTAL noted that it would conduct further investigation prior to the selection of specific well sites for reinjection and that it would provide this material in future applications to the ERCB. TOTAL stated that it preferred reinjection for managing water from dewatering operations; however, it would investigate other options in the future if warranted. As well, TOTAL indicated that it would continue to work with CNRL on the regional aspects of basal water handling.

6.3.3.2 Views of Interveners

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

The Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175 supported a monitoring system that would identify sources of seepage. They also recommended that outcrops flowing into the Athabasca River should be identified, sampled, and monitored.

Government of Canada

NRCan submitted that its hydrogeologic review raised uncertainties in TOTAL's predictions for groundwater quantity and quality impact and resultant changes in surface water quality and quantity. It believed that TOTAL did not adequately address groundwater quality and quantity, narrow surficial aquifer removal, and monitoring and mitigation.

NRCan stated that mining activities can affect groundwater quantity and quality through altered groundwater flow patterns and possible groundwater contaminant migration pathways. NRCan maintained that it therefore was essential to establish groundwater baseline conditions, make appropriate predictions, and implement detailed post-closure monitoring and mitigation.

NRCan's concern was focused on TOTAL's ability to make reasonable predictions regarding the groundwater regime. It recommended that TOTAL's application should have included a complete conceptual groundwater model so that there could be confidence in the predictions generated by the numerical groundwater flow model found in TOTAL's 2010 groundwater model. NRCan noted that a well developed conceptual model is necessary to develop a numerical model that makes accurate predictions.

NRCan also noted that TOTAL did not provide a sensitivity analysis of the numerical model which is necessary to quantify the uncertainties in the calibrated model. Without this analysis, it maintained that it is unknown whether the model is capable of predicting reasonable results. It said that TOTAL should have included a discussion on how uncertainties in inputs could impact model predictions as such uncertainties could significantly change model predictions.

NRCan expressed concern that the TOTAL mine plan included removal of the narrow surficial aquifer located in the north-central to northeastern portion of the local study area, as this is the only source of potable water on the lease, and that the aquifer discharges to muskeg and surface water, including the Athabasca River. Although NRCan acknowledged that impacts to the Athabasca River would likely be very small, it recommended that further work be done to quantify the effects of the aquifer removal on water quality and quantity in muskeg and surface water.

Given NRCan's low confidence in TOTAL's numerical model predictions, it maintained that a sound monitoring program is essential to generating data and gaining a further understanding of the groundwater regime. NRCan noted that TOTAL had stated that it would submit a final monitoring plan under its *Environment Protection and Enhancement Act* applications, but that in this application, the type of monitoring to be conducted was unclear. It indicated that part of its concern stemmed from the fact that it was unable to review the monitoring plan during its review of the application. NRCan accepted TOTAL's offer to gather NRCan's input and suggestions on the plan TOTAL would be submitting to AENV in support of its *Environment Protection and Enhancement Act* applications.

6.3.3.3 Panel Conclusions and Recommendations

The Panel recognizes the importance of monitoring programs to assess project impacts, validate and adjust models, and mitigate problems. The Panel understands that TOTAL would be submitting further information to AENV as part of its *Environment Protection and Enhancement Act* applications for its groundwater monitoring program. The Panel is confident that this would ensure that a suitable groundwater monitoring program is in place and that it would satisfy the interveners' and NRCan's concerns.

6.4 Fish and Fish Habitat

6.4.1 Views of TOTAL

TOTAL assessed the potential project effects on fish habitat and on the health and survival of several valued fish species: the arctic grayling, longnose sucker, northern pike, northern redbelly dace, slimy sculpin, walleye, white sucker, and fish populations in general. Components that TOTAL assessed included

- direct physical disruptions of fish habitat in the local study area associated with the revised Joslyn Creek realignment,
- changes in flow regime associated with the revised Joslyn Creek realignment,
- effects on fish populations in the local study area and regional study area due to the revised Joslyn Creek realignment,
- effects on fish populations in the regional study area due to the release of pit lake water into the Ells River at closure, and
- effects on fish habitat and fish populations in the local study area and regional study area due to project water requirements.

TOTAL conducted baseline studies to detect fish in the Ells River and its tributaries, Joslyn Creek and its tributaries, tributaries of the MacKay River, and parts of the Athabasca River. TOTAL also conducted a habitat inventory for each site within the local study area. It used Habitat Suitability Index models[31] to assess effects. TOTAL stated that since there are no developments currently in the Joslyn River watershed, baseline studies represent pre-industrial conditions.

TOTAL examined the effects on fish habitat from the removal of Ells River Tributary 1 (Figure 3) and the diversion of flows from Joslyn Creek and Joslyn Creek Tributary 5 through constructed channels, a wetland, and a fish habitat compensation lake to the Ells River. The removal of habitat would affect the lower 2.8 kilometres of Joslyn Creek Tributary 5 and the lower 23.5 kilometres of Joslyn Creek.

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[31] The Habitat Suitability Index models used variables representing specific habitat requirements for various life stages of a given species to evaluate habitat quality.

TOTAL predicted that the redirection of flow from Joslyn Creek to the Ells River Tributary 4 would increase flow in the tributary, which could increase sedimentation and negatively affect fish habitat. TOTAL also proposed that the increased flow to the Ells River Tributary 4 would have a positive effect because it would increase base flow and improve habitat conditions. According to TOTAL, these watercourses are subject to extreme low flow conditions; adding the Joslyn Creek flows to Ells River Tributary 4 would increase base flow in that tributary and could improve habitat conditions, including seasonal habitat and overwintering potential.

TOTAL predicted some loss to Joslyn Creek fish populations downstream of the proposed realignment because this part of Joslyn Creek would no longer exist. TOTAL also predicted a potential increase in fish numbers and species diversity in the lower Ells River Tributary 4 due to increased flow, increasing habitat availability in this tributary.

TOTAL predicted no significant effects on water quality and therefore no effects on fish health from changes in water quality (Section 6.3.2.1).

TOTAL identified the following measures to mitigate the project's effects on fish and fish habitat:

- conducting all in-stream work during the low-flow period, respecting timing restrictions as prescribed by AENV;
- salvaging fish in the dewatered part of Joslyn Creek;
- implementing a surface water management plan;
- improving the channel to Tributary 4 to mitigate the potential for sedimentation;
- providing fish passage and maintaining contiguous habitat in the local study area and regional study area during the realignment of Joslyn Creek and Ells River Tributary 4;
- implementing a "no-net-loss" plan which would include
  - the creation of a fish habitat compensation lake,
  - the realignment of Joslyn Creek Tributary 5,
  - the construction of a wetland area upstream of the compensation lake,
  - the construction of an inlet channel to the lake, and
  - the construction of an outlet channel from the compensation lake.

TOTAL concluded that the project's effects on fish habitat from changes in stream flow in the Joslyn-Ells watercourse would be insignificant. It would mitigate direct habitat loss in the local study area by increasing habitat availability resulting from compensation works. TOTAL also noted that the effects on fish populations would be insignificant. It predicted that any reduction in fish populations from habitat removal would be insignificant because project habitat enhancement measures would compensate for such losses.

6.4.2 Views of Interveners

Environmental Defence (Untested Evidence)

Environmental Defence submitted that the Government of Canada is in breach of its commitment under the North American Agreement on Environmental Cooperation to effectively enforce Section 36(3) of the *Fisheries Act*, against the practice of leaking substances from oil sands tailings ponds.

Sierra Club Prairie and Oil Sands Environmental Coalition

Sierra Club Prairie and OSEC proposed that RAMP's and TOTAL's methodologies for detecting pollutants were not sophisticated enough to detect toxic levels. It indicated that polycyclic aromatic hydrocarbons, heavy metals, and naphthenic acids could be at levels that can affect the embryonic development of certain fish species (Section 7.4 for more information on cumulative water quality issues). Sierra Club Prairie and OSEC also indicated that the compensation lake TOTAL would create would likely contain pollutants that may affect fish health. Sierra Club Prairie explained that sediments that would accumulate in the compensation lake could contain contaminants that can accumulate in invertebrates and make their way up the food chain to the fish.

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

The Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175 wanted fish population studies conducted. They were concerned that baseline studies on fish were lacking and that comparison of what would be observed during follow-up studies could not be made. They also expressed concerns about sensitive species, such as arctic grayling and walleye. They would like to know where these species spawn so that those areas can be protected. They recommended monitoring water quality to ensure good fish habitat. They also expressed concerns about the amount of muskeg removed. They stated that muskeg keeps water in the streams cool for the fish and also provides tannins that colour the water and protect fish eggs from sunlight.

Government of Canada

DFO indicated that the project would result in a loss of fish habitat and impact surface and subsurface water flow regimes. It stated that the project would harmfully alter, disrupt, or destroy fish habitat in Joslyn Creek, Joslyn Creek Tributary 5, and Ells River Tributaries 1 and 4. DFO also noted that construction of the river water intake on the Athabasca River might impact habitat. DFO stated that it is working with TOTAL to finalize a "no-net-loss" plan that would achieve permanent fish habitat gains. It noted that DFO would consult with aboriginal groups and government agencies on the plan and the development of appropriate monitoring programs. Taking into account the proposed fish habitat compensation plan, mitigation measures, and follow-up and monitoring, DFO was confident that there would be "no-net-loss" of fish habitat in the local study area.

DFO stated that a reduction in stream flow could adversely impact water quality and the spawning, rearing, feeding, migration, and over-wintering habitats of fish. DFO indicated that even though the most extreme low-flow conditions for fish are usually in winter, reduced flow in any season can adversely affect fish habitat productivity. DFO asserted that adverse impacts of water withdrawals on fish and fish habitat could increase during low-flow conditions. DFO stated that it would ensure that the principles laid out in CEMA's *Phase II Water Management Framework* and DFO's habitat policy are applied to the project.

DFO noted that it is working with TOTAL to further assess the impacts on habitat to ensure that these impacts are limited as much as possible and that any residual impacts are compensated for. DFO requested that TOTAL replace any residual impacts at a minimum compensation ratio of 2:1. It stated that the potential impacts of river water intake and associated water withdrawals have not been considered in the current "no-net-loss" plan. DFO would assess whether this plan is sufficient.

DFO expressed its concern about the uncertainty of the predictive models. It stated that the models are based on limited data and a number of assumptions and cannot predict with certainty the success of fish habitat compensation. Therefore, DFO requires validation and monitoring to ensure accurate fish habitat impact predictions and the achievement of fish habitat compensation goals. DFO would require conditions in its authorization to TOTAL, including the use of adaptive management if new information clarifies the uncertainties.

When questioned about ecosystem base flow and whether it agreed with Dr. Donahue regarding an ecosystem base flow of 87 cubic metres per second on the Athabasca River, DFO noted that the Instream Flow Needs Technical Task Group looked at the potential impacts on fish and the aquatic environment and could not establish any threshold below which some catastrophic response to water withdrawals would exist, but DFO has adopted the 87 cubic metres per second.

DFO noted that it does not monitor water quality in compensation lakes for contaminants from air emissions. It noted that if the lake does not satisfy the "no-net-loss" of fish habitat, it would investigate to find out the cause.

DFO recommended that TOTAL

- implement a detailed "no-net-loss" plan that would provide, at minimum, a 2:1 ratio of fish habitat compensation based on habitat units;
- develop and implement, in consultation with DFO, a plan to compensate for potential impacts of river water intake on fish habitat once all the necessary river water intake details have been compiled;
- develop and implement a monitoring program, to the satisfaction of DFO, to validate models and verify predictions about quality and quantity of fish habitat in the predisturbed habitat and in the proposed fish habitat compensation structures; and
- develop and implement a monitoring program, to the satisfaction of DFO, to verify compliance with commitments in the "no-net-loss" plan and with all conditions of any authorization.

6.4.3 Panel Conclusions and Recommendations

The Panel is of the view that, given the compensation plan proposed by TOTAL and the need for its approval by DFO, the project is unlikely to have significant adverse effects on fish and fish habitat. The proposed mitigation measures include a fish habitat compensation plan that would replace habitat at a ratio of 2:1. The Panel is confident that since DFO has final approval of any compensation plan, it would ensure that the effects on fish and fish habitat are appropriately mitigated.

The Panel agrees with DFO's proposed recommendations (Section 6.4.2). If the project is authorized, the Panel understands that DFO's proposed recommendations would be among its conditions of approval. The Panel expects TOTAL to continue working with DFO to ensure that it meets all of the recommendations to DFO's satisfaction.

6.5 Air Quality

6.5.1 Views of TOTAL

TOTAL stated that it would carry out mining activities and movement of material using a conventional truck-and-shovel operation in conjunction with hydro-transportation slurry pipelines where possible. TOTAL stated that its mine haul truck fleet would be United States Environmental Protection Agency (EPA) Tier IV compliant, representing the best available technology economically achievable for reduced oxides of nitrogen emissions for this type of equipment. Additionally, TOTAL committed to meeting the Canadian Council of Ministers of the Environment's *National Emission Guideline for Commercial/Industrial Boilers and Heaters*, and AENV's interim oxides of nitrogen guidelines for stationary sources. TOTAL stated that the use of slurry pipelines, along with effective planning, would help achieve efficiency and minimize air emissions from the vehicles.

TOTAL stated that air dispersion models are designed to accurately but conservatively predict concentration and deposition, allowing practitioners to apply the results with the understanding that the effects will likely be lower than predicted. TOTAL indicated that it based its modelling on the maximum expected emission rates; therefore, predictions from its model represent the maximum expected concentration and deposition. TOTAL stated that it based its assessment on the assumption that all approved projects would proceed. TOTAL further noted that it assumed that all mining developments in the planned development case would meet Tier IV standards.

In its 2010 Additional Information—Project Update, TOTAL provided a summary of the project's estimated air emissions. For sulphur dioxide, TOTAL noted that the project would use ultralow sulphur diesel fuel. As a result, it would cause a negligible influence on sulphur dioxide levels at the project camp, trapper's cabin, and Fort McKay. TOTAL noted that the cumulative changes in sulphur dioxide levels resulting from the project, combined with other developments, would be insignificant.

For nitrogen dioxide, TOTAL did not predict exceedances of the Alberta Ambient Air Quality Objectives (the objectives) in the regional study area. TOTAL predicted that the carbon monoxide emissions for the baseline case, the application case, and the planned development case would be well below the objectives.

TOTAL predicted that the hourly Alberta Ambient Air Quality Guidelines (the guidelines) and 24-hour objectives for fine particulate matter with a diameter smaller than 2.5μm (fine particulate matter) would be exceeded at the following four locations: the maximum point of impingement, the fenceline, the project camp, and the trapper's cabin. TOTAL indicated that the modelled fine particulate matter concentrations increased from the baseline case to the application case. Modelled hourly concentrations at the trapper cabin increased from 74 micrograms per cubic metre in the baseline case to 84 micrograms per cubic metre in the application case. However, TOTAL indicated that in the planned development case, the modelled concentrations decreased to 54 micrograms per cubic metre and did not exceed the hourly guidelines threshold of 80 micrograms per cubic metre.

In addition, TOTAL noted that the predicted 24-hour concentrations of fine particulate matter at the trappers' cabin in the baseline case increased from 35 to 40 micrograms per cubic metre. However, TOTAL indicated that in the planned development case, the modelled concentrations of fine particulate matter at the trappers' cabin decreased to 30 micrograms per cubic metre and did not exceed the 24-hour objectives threshold of 30 micrograms per cubic metre.

TOTAL predicted that fine particulate matter thresholds for the 24-hour objectives would be exceeded at Fort McKay in the baseline case but noted that the project would not result in additional exceedances. TOTAL indicated that frequency of hourly guidelines exceedances would increase to a maximum of 0.24 per cent at the project camp and 0.03 per cent at the trappers' cabin in the application case. TOTAL further stated that the frequency of 24-hour objectives exceedances would increase to a maximum of 1.6 per cent at the project camp in the application case from 0.8 per cent in the baseline case. In summary, TOTAL indicated that predicted cumulative changes to fine particulate matter levels from the project, combined with other developments, would be insignificant.

TOTAL stated that the project would generate trace gaseous chemical compounds, such as polycyclic aromatic hydrocarbons, volatile organic compounds, and total reduced sulphur compounds. However, TOTAL's predictions showed that except for benzene (hourly), benzo(a)pyrene (annual), and hydrogen sulphide (hourly and 24-hour), all other predicted concentrations were below their respective objectives. TOTAL indicated there were no predicted exceedances of the respective objectives at any of the community receptors. TOTAL also predicted that exceedances of benzene and benzo(a)pyrene occur at the maximum point of impingement for only the planned development case, about 20 kilometres south of the project. However, TOTAL indicated that the benzo(a)pyrene exceedance was a result of a conservative assumption that the population of Fort McMurray and the associated traffic would nearly double. TOTAL predicted exceedances of hydrogen sulphide for all three cases occurring near an existing development about 20 kilometres south of the project. TOTAL stated that the contribution of benzene, benzo(a)pyrene, and hydrogen sulphide concentrations from the project at Fort McKay was negligible. TOTAL further stated that the predicted cumulative changes to levels of volatile organic compounds, polycyclic aromatic hydrocarbons, and total reduced sulphur compounds from the project combined with other developments remain insignificant.

TOTAL predicted that the cumulative effects on potential acid input levels would range from negligible on a regional scale to small on a local scale.

TOTAL stated that with the exception of hydrogen sulphide and thiophenes, all predicted hourly and three-minute air concentrations were below mean odour thresholds for all cases. The exceedances of the odour threshold for hydrogen sulphide occurred at the maximum point of impingement, about 20 kilometres south of the project. TOTAL stated that adding the project would not increase the frequency of this exceedance occurring at that location. TOTAL stated that it predicted odour exceedances of thiophenes to occur at the maximum point of impingement and the project fenceline. TOTAL further stated that the maximum point of impingement exceedance was about 5 kilometres east of the project and that adding the project would not increase the frequency of exceedances there.

TOTAL stated that it compared predicted odour concentrations only to the mean odour threshold. TOTAL stated that it was possible that more sensitive individuals would be able to detect odours at air concentrations below this threshold. TOTAL concluded that cumulative changes to the odour levels resulting from the project combined with other developments would remain insignificant. TOTAL stated that it would continue to consult with representatives of Fort McKay and regulators to address odour issues in the community and support the notification protocol that Fort McKay was developing with industry to address times when air quality is of concern.

TOTAL's proposed measures to maintain air quality at an appropriate and safe level included

- using EPA Tier IV compliant haul trucks for the mining operation,
- using technology for boilers and cogeneration units that would result in emitted oxides of nitrogen concentrations lower than the compliance limits in the current AENV interim emission guidelines for oxides of nitrogen,
- using a paraffinic froth treatment process with redundant solvent recovery equipment to minimize emissions from tailings ponds,
- monitoring solvent levels in the tailings stream and at the pond's surface,
- not releasing untreated froth treatment tailings into the pond,
- enhancing regional monitoring of air emissions by working with the Wood Buffalo Environmental Association (WBEA) and other operators,
- not continuously flaring during operations,
- continuing work with CEMA, as appropriate, on air quality issues,
- installing vapour recovery systems,
- applying water or approved dust suppressants during dry periods to manage dust from haul routes,
- minimizing the potential for odours for the Fort McKay community, and
- working with local stakeholders to develop an odour notification protocol and working with stakeholders and WBEA to ensure that appropriate monitoring is in place to track potential odour events.

TOTAL also made specific commitments to Fort McKay, which included

- measuring emission fluxes from the tailings ponds,
- mitigating tailings pond emissions,
- using oxides of nitrogen management abatement technology on stationary equipment that will result in oxides of nitrogen emission concentrations below the AENV interim emission guidelines for oxides of nitrogen,
- complying with AENV's expected emission limits for managing oxides of nitrogen emissions associated with gas turbine/heat recovery steam generation combinations,
- providing funding for an additional ambient air quality monitoring station, and
- using best efforts to limit the project's contribution to exceedances of the air quality standards recommended by Fort McKay.

Taking into account its proposed mitigation measures, TOTAL predicted that there would not be any significant adverse effects associated with the air emissions from the project.

6.5.2 Views of Interveners

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

In final argument, the Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175 expressed concern with recent increases in air quality exceedances. They recommended more precise air monitoring to accurately identify the source of air quality exceedances.

Oil Sands Environmental Coalition

OSEC stated that the project would be a new source of nitrogen oxides, sulphur dioxide, carbon monoxide, and particulate matter in the region and would contribute to ground-level concentrations of these pollutants. OSEC noted that these pollutants are associated with environmental and human health impacts.

OSEC noted that the guidelines in the Alberta Ambient Air Quality Objectives (the objectives) are not values determined solely for the protection of human health. Rather, OSEC stated that they have been compromised in order to permit the creation of other nonhealth related, social, economic, and political benefits. OSEC provided a comparison of health value guidelines in various jurisdictions related to ambient air quality objectives and standards. OSEC indicated that World Health Organization guidelines, in contrast with the Alberta objectives, prescribed the quality of air that people would have without compromising air quality for other outcomes.

OSEC indicated that TOTAL's proposed measures to mitigate oxides of nitrogen emissions were not sufficient. OSEC stated that TOTAL presented information in its application showing that nitrogen dioxide predictions would be within the objectives. OSEC agreed that the using Tier IV vehicles in TOTAL's mine fleet would represent the most stringent air emissions limits issued for such vehicles. However, OSEC expressed the view that in determining the public interest, simply complying with regulatory requirements was not sufficient given the availability of other science-based guidance; therefore, OSEC recommended that TOTAL be required to retrofit air emissions reduction technology, such as selective catalytic reduction, on its mine fleet when such technology becomes commercially available.

Government of Canada

EC stated that the increase in overall air emissions in the oil sands region as a result of the project would be relatively small. It indicated that the project's estimated level of sulphur dioxide emissions would be 0.0004 per cent of the regional emissions. EC also indicated that fine particulate matter emissions would be less than 1 per cent of regional emissions and oxides of nitrogen and carbon monoxide emissions less than 2 per cent.

EC noted that TOTAL estimated that its mine fleet would emit 70 per cent of the project's total oxides of nitrogen emissions and 23 per cent of its fine particulate matter emissions. EC acknowledged TOTAL's commitment to mitigate air emissions using Tier IV mine haul trucks. EC recommended that if these Tier IV trucks are not available for purchase, the Panel should require TOTAL to retrofit any preTier IV trucks with aftertreatment devices so that the predicted emissions are not exceeded.

EC stated that TOTAL's prediction indicated that ambient benzene levels would exceed the hourly objectives of the planned development case. EC indicated that according to the current WBEA monitoring program, only 24-hour air samples would be taken to analyze benzene and emissions of volatile organic compounds. EC noted that 24-hour air samples provide limited information on compliance with hourly benzene objectives and that it would not be possible to demonstrate compliance with the objectives.

EC recommended that TOTAL cooperate with other oil sands operators to implement a monitoring program to measure hourly ambient concentrations of benzene and other relevant volatile organic compounds. It also recommended that TOTAL consider further mitigation measures such as using the best available technology if ambient air monitoring demonstrates that exceedances are occurring.

EC indicated that the estimated level of the project's emissions from volatile organic compounds would be less than 8 per cent of the regional emissions. EC also indicated that 94 per cent of the project's total emissions from volatile organic compounds would be from the tailings ponds. EC recommended that TOTAL develop and implement a monitoring program to determine the magnitude and speciation of tailings pond air emissions.

EC stated that it was supportive of several of TOTAL's commitments to Fort McKay.

6.5.3 Panel Conclusions and Recommendations

The Panel believes that, in a regional context, the proposed project's air emissions would be relatively small and are not likely to pose unacceptable environmental and public risks. The Panel also believes that air emissions are an important concern for a number of stakeholders and expects TOTAL to follow through on its commitments.

The Panel understands that the intent of the Alberta Ambient Air Quality Objectives (the objectives) is to protect the environment and human health to a technically and economically feasible extent. The Panel notes that the *Environmental Protection and Enhancement Act* allows AENV to develop ambient air quality objectives and guidelines for all or part of the province to protect Alberta's air quality. The Panel also understands that the objectives are equal to or more stringent than existing National Ambient Air Quality Objectives and Canada Wide Standards. The Panel believes that using the Alberta objectives as a significant indicator of air quality is widely accepted and reasonable.

The Panel notes that for most air quality criteria, there are not any exceedances of the objectives forecasted for all three cases. However, the Panel notes that there are predicted exceedances for benzene, hydrogen sulphide, and fine particulate matter concentrations. The Panel believes that these predicted exceedances are most likely due to conservative assumptions in the modelling and that actual exceedances are not likely to occur to the extent and frequency forecasted. The Panel also believes that the project would not be a major source of sulphur emissions. The Panel agrees that exceedances already exist in the baseline case due to conservative assumptions in the modelling and that the project would not materially change the frequency of exceedances.

The Panel agrees with EC that 24-hour air samples provide limited information on compliance with hourly benzene concentrations and that it would be difficult to demonstrate compliance with the objectives. The Panel recommends to the Government of Alberta that it develop appropriate *Environmental Protection and Enhancement Act* approval requirements to address continuous benzene monitoring for compliance with the objectives.

The Panel considers that proponents of new or expanding oil sands schemes in Alberta need to be aware of reasonably foreseeable changes to current emission standards and new environmental management frameworks and of the need to incorporate flexibility into the project design to facilitate retrofitting of improved controls. As changes to current source emission standards are reasonably foreseeable, the Panel recommends that TOTAL as well as proponents of new or expanding oil sands projects incorporate flexibility into their projects so that they can achieve compliance with future standards within a reasonable timeframe.

The Panel concludes that the project is not likely to result in significant adverse environmental effects to air quality, provided that the mitigation measures and the Panel's recommendations are implemented.

6.6 Historical and Palaeontological Resources

6.6.1 Views of TOTAL

Historical Resources Assessment

TOTAL submitted that it undertook multiple historical resources impact assessment field studies and mitigation studies in relation to the project. The assessments included the development of a model of archaeological potential to predict areas of moderate to high archaeological potential that required investigation and extensive field work and data collection and analysis.

TOTAL identified 28 significant historic resources sites within the project area, some of which it identified as holding high heritage value, such as campsites, scatters, and workshops. TOTAL conducted additional mitigation studies on those sites it considered to have high heritage value. Following its mitigation studies, TOTAL obtained permits from Alberta Culture and Community

Spirit to conduct the recommended mitigation on these sites, including shovel testing, collection, and excavation. An additional 9 sites remained in areas proposed for development. TOTAL stated that it would carry out mitigation for these sites prior to development.

TOTAL also conducted field studies on the revised off-stream storage pond location. It found one significant site that would require mitigation.

In response to the concerns of the Non-Status Fort McMurray Band Descendants concerning a pipe stone known to be found in the Fort McKay area, TOTAL noted that the pipe stone was a rare, shaly limestone. TOTAL noted that this pipe stone can outcrop along river valleys, such as the Ells and Athabasca Rivers; however, its investigations did not identify the stone within the local study area.

TOTAL submitted a letter from the Historical Resources Management Branch of Alberta Culture and Community Spirit that noted that TOTAL had satisfactorily addressed the preapproval requirements for the project.

TOTAL predicted that the project would not result in any residual negative effects on historic resources after the implementation of mitigation measures. TOTAL noted that as a result of the permit process, Alberta Culture and Community Spirit would identify the threshold for determining significance of effects on historic resources during the approval process as it ultimately would determine the mitigation measures to be implemented.

Paleontological Resource Assessment

TOTAL submitted that the project had the potential to disturb Cretaceous marine reptile fossils found within the Wabiskaw Member of the Clearwater Formation. While TOTAL did not find any significant paleontological resources in its assessment, it identified areas in the project's footprint where paleontological resources may be affected should mining commence.

TOTAL proposed a number of measures to mitigate potential effects to the extent possible, both before and during operations. The measures included

- having a paleontologist review the final development plans,
- implementing a paleontological monitoring plan, and
- developing and implementing a paleontological education program for employees.

TOTAL concluded that by implementing mitigation measures, the project's effects on paleontological resources would be insignificant.

6.6.2 Views of Interveners

Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175

The Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175 noted that the region contained a rare pipe stone used by aboriginal people. These groups were concerned that TOTAL had not found areas containing the stone on the Joslyn lease.

The Non-Status Fort McMurray Band Descendents, in closing argument, expressed concern that TOTAL and other oil sands operators had not identified gravesites or sacred sites on the land. It recommended that a more thorough analysis be conducted before any projects proceed.

Mike Guertin

Mr. Guertin noted his concern that the project may impact numerous grave sites along the Athabasca River. He identified Point Brearly, Poplar Point, Jackfish, and Fidler's Point among others as having grave sites.

6.6.3 Panel Conclusions and Recommendations

The Panel notes that TOTAL completed extensive assessment of historical resources impact, mitigation studies, and paleontological studies.

The Panel also notes that the Historical Resources Management Branch of Alberta Culture and Community Spirit was satisfied that TOTAL has met the preapproval requirements for the project.

In the matter of the potential grave sites identified by local community members in the area of Fort McKay, the Panel notes that TOTAL's historical resources impact assessment did not identify any grave sites.

The Panel is of the view that with the successful implementation of the proposed mitigation measures to be determined in collaboration with the Historical Resources Management Branch, the project would not have a significant adverse impact on historical or paleontological resources.

6.7 Current Use of Lands and Resources for Traditional Purpose by Aboriginal Persons

6.7.1 Views of TOTAL

TOTAL stated that it had conducted and/or funded extensive traditional land use and traditional ecological knowledge studies to provide information on the potential effects of its operations on traditional pursuits and the best ways to mitigate those effects. TOTAL indicated that it would take steps to ensure that traditional pursuits could be practiced following project completion and reclamation. TOTAL indicated that it had committed to ensure that aboriginal groups were involved and had input into all aspects of reclamation, including the formation of topography and the selection of ecosite phases that support a variety of traditional plants and land uses after closure.

TOTAL stated that it was committed to a number of mitigation strategies to offset the effects of the project on traditional land use. These strategies included continued access west of the Joslyn lease, consultation with directly-affected trappers, and prohibiting mine employees from accessing natural areas outside of the project for hunting, fishing, or other recreational purposes. TOTAL also committed to the development of a "no-net-loss" fish and fish habitat compensation plan in conjunction with DFO.

6.7.2 Views of Interveners

Mikisew Cree First Nation (Untested Evidence)

MCFN noted that the project was located in the southern portion of its traditional territory. MCFN noted that it traditionally used the Athabasca River as its primary transportation corridor, travelling extensively throughout its lands. MCFN noted another main corridor in the southern portion of its territory extending across the Joslyn lease from Fort McKay west to the Birch Mountains where MCFN members hunted and trapped.

MCFN members noted changes to their land use patterns. MCFN noted that its members have used fewer and different sites than in the past. MCFN noted a shift away from traditional use along the Athabasca River to north and west of Fort McKay. MCFN predominantly used the northern portion of their traditional territory in and around Lake Athabasca and Lake Claire. However, MCFN noted that the Fort McKay area was a secondary hub of traditional use activity where seasonal rounds on both sides of the Athabasca took place.

MCFN submitted that it had undergone a shift from a traditional "bush" economy to a more contemporary wage economy. MCFN noted that many members had moved south to take advantage of economic opportunities. On weekends or time off, MCFN members noted that they enjoyed spending time on the land with their families in order to maintain their connection with the land. MCFN members believed that it was important to teach their children their traditional way of life.

MCFN identified the Joslyn lease as having been used for hunting large game, such as moose and caribou, as well as for waterfowl and other birds such as ducks, geese and ptarmigan. MCFN members also noted having trapped and fished on the Joslyn lease. However, MCFN members noted declines in furbearer species. MCFN members noted that they fished in the McKay, Ells, and Athabasca Rivers.

MCFN members valued numerous plants such as berries, herbs and medicines. MCFN noted having traditionally picked berries from the Fort McKay area; however, many noted to have stopped picking berries for fear of pollution or because of low abundance. Cranberries were noted by MCFN members to be gathered in areas of Jack pine within the Joslyn lease.

Fort McKay First Nation and Métis Nation Local # 63 (Untested Evidence)

Fort McKay believed that the land is an integral part to its cultural well-being and wholeness. Fort McKay noted that the project would be located within areas of intense to moderate traditional use; however it noted that the nature of traditional land use that takes place over its entire traditional territory is seasonal.

Fort McKay members identified a number of sites and areas currently in use by its members in and around the Joslyn lease. Fort McKay noted that the mouth of the Ells River is widely used for hunting, trapping, fishing, gathering, canoeing, and family camping. Fort McKay also noted that it currently uses the Jack pine area for picking berries, gathering medicines, and hunting moose.

Fort McKay expressed concern about the pace and scale of development occurring within its traditional lands and most importantly, within close proximity of its community. Fort McKay indicated that it felt it would be closed-in and unable to access traditional lands whereby it could exercise its Treaty 8 rights. Fort McKay identified that the development of its lands has led to a concentration of traditional activities in lands that remain intact, including the Joslyn lease. Fort McKay expressed that these remaining areas have become increasingly important as they represent opportunities for recreation, cultural continuity, and the ability to exercise Treaty 8 rights.

Fort McKay noted trapping sites on or near the Joslyn lease located primarily along the Ells and Athabasca River valleys. Fort McKay submitted that the project would affect two main trappers' traplines: those of James and Rick Grandejambe.

Fort McKay submitted that it traditionally hunted five main species of big game as well as numerous species of migratory and non-migratory waterfowl and birds within the Joslyn lease. Fort McKay identified the Joslyn lease area as an important big game hunting site, specifically west towards the Birch Mountains and along the Athabasca River. Fort McKay members traditionally caught many local species of river and lake fish. Fort McKay members noted having fished in the Ells and Athabasca Rivers.

Fort McKay members noted that subsistence opportunities have been hampered by a decline in wildlife populations. Fort McKay members noted significant declines in moose, furbearer, and waterfowl populations, forcing members to hunt in areas further from the community.

Athabasca Chipewyan First Nation (Untested Evidence)

ACFN submitted that the project would fall within the southern portion of its traditional lands. ACFN asserted that its members continue to practice traditional pursuits in the project area, including hunting, gathering, fishing, trapping, and camping.

ACFN submitted that the confluence of the Ells and Athabasca Rivers, including the lower portion of the Ells River valley, was an important cultural and spiritual site. Similar to Fort McKay and MCFN, ACFN noted that it used travel routes or corridors through the Joslyn lease area towards the Birch Mountains.

ACFN members noted having hunted and trapped along the Athabasca River north and south of Fort McKay as well as in the Birch Mountains. ACFN members have observed, however, a decline in the quality of moose and other meat. ACFN noted it used the Jack pine area in the project footprint as an important subsistence area for gathering food, plants, and medicine. ACFN members observed a general decline in the quality of berries collected in the southern portion of their traditional territory along the Athabasca River.

6.7.3 Panel Conclusions and Recommendations

Prior to the public hearing, the MCFN, ACFN, and Fort McKay submitted current and traditional use information. Prior to the start of the hearing or shortly after, these groups withdrew their objection to the project, choosing to address their project-specific concerns directly with TOTAL. As such, these groups did not bring forth witnesses to speak to their evidence, nor was their evidence tested through cross-examination or questioning from the Panel. As a result, the Panel

cannot grant much weight to the evidence submitted with respect to the current use of lands and resources by aboriginal persons.

The Panel acknowledges that Fort McKay, MCFN, and ACFN have withdrawn their project-specific concerns for this project. The Panel also acknowledges that these aboriginal groups have signed agreements with TOTAL in order to mitigate their project-specific concerns. The Panel recognizes that while the project area is currently being used by these aboriginal groups for traditional purposes, the Panel is confident that TOTAL can successfully mitigate, in combination with the implementation of the Panel's conditions and recommendations, the negative effects caused by the project. To this end, the Panel notes TOTAL's efforts to assess potential effects to traditional resources and ways to mitigate those effects. Furthermore, the Panel notes TOTAL's ongoing commitment to work cooperatively with aboriginal groups in the area.

The Panel acknowledges aboriginal groups' concerns that the proposed project would eliminate existing access west of the lease and access to the Moose Lake trail. The Panel notes that the removal of traditionally used access routes by aboriginal groups through the Joslyn lease would hinder their ability to practice traditional land use activities. The Panel notes that TOTAL and Fort McKay have been working together to develop an access management plan for the Moose Lake Trail and relocate the cabin of the local trapper that would be affected should the project proceed.

The Panel concludes that with the implementation of proposed mitigation measures and commitments, the project would not cause significant adverse effects to aboriginal persons' current use of lands and resources for traditional purposes.

6.8 Effects of Potential Accidents and Malfunctions

6.8.1 Views of TOTAL

TOTAL provided information on the probability of accidents and malfunctions associated with the project, including potential consequences and environmental effects related to such events. TOTAL identified potential accidents and malfunctions associated with various project components, including

- tailings dyke failure;
- failure of waterfowl deterrent systems;
- a major tailings spill to surface watercourses;
- accidental releases associated with waste management and disposal;
- spills occurring during on-site handling of fuels, chemicals, or other hazardous materials;
- increased road traffic and risk of road accidents;
- potential accidents or malfunctions arising from proximity of steam assisted gravity drainage and mining operations; and
- breach of site security.

For each of the potential accidents and malfunctions listed above, TOTAL briefly described the frequency and likelihood of occurrence, spatial extent, magnitude, and reversibility of effects. TOTAL stated that it derived the estimates using an internal risk management process, and that it would continue to revise the estimates as the project progressed.

TOTAL committed to working with stakeholders to develop comprehensive emergency response plans that would identify, describe, and evaluate the potential impact of project-related accidents and malfunctions and identify procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or threat of release. TOTAL also stated that the plans would include detailed modelling of all potential spill scenarios and evaluation of response options and resource requirements.

TOTAL stated that it would provide the emergency response plan to the ERCB for review at a later stage in the project.

During the hearing, TOTAL stated that it did not provide detailed model spill scenarios describing the specific consequences of tailing structure failures because it had determined that the likelihood of tailing structure failure was minimal. TOTAL stated that it would adhere to the Canadian Dam Association's Dam Safety Guidelines during the construction and operation of tailings structures.

TOTAL described several malfunctions that could occur as a result of effects of the environment on the project. Over-topping of dykes could occur under extreme precipitation, wind, or wave conditions, resulting in the release of process-affected water and the erosion of dyke slopes. TOTAL stated that it would mitigate this by designing tailings pond dykes with a minimum freeboard of 3 metres, which TOTAL stated would be sufficient to withstand a 1 in 1000-year wind event under normal operating conditions and a 1 in 100-year wind event under flooding conditions.

TOTAL stated that extreme precipitation, flood, or wind events could result in the release of process-affected water from the system of ditches and collection ponds designed to prevent this water from reaching surface watercourses. TOTAL stated that it would mitigate this by constructing the ditch and collection ponds with sufficient capacity to accommodate 1 in 100-year flood events and an adequate distance from watercourses to minimize the potential impacts in the event of an overflow.

TOTAL stated that erosion of the pit lake's shoreline could potentially affect both its stability and the stability of shoreline landforms and alter the flow rate and flow path of the pit lake into the Ells River, which could contribute to sediment loading in the Ells River. TOTAL stated that it would minimize erosion of the pit lake's shoreline by placing littoral vegetation and wave-breaking structures along the shoreline.

6.8.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC stated that TOTAL did not adequately describe the environmental effects and public safety consequences of potential accidents or malfunctions. In particular, OSEC cited a lack of information on the environmental consequences of a tailings dam breach. OSEC noted that

TOTAL had not provided the Panel with summaries of emergency response and mitigation plans, as required in the terms of reference for the environmental assessment of the project.

Government of Canada

EC requested that TOTAL be required to develop comprehensive emergency response plans that identify, describe, and evaluate the potential impacts of all project-related accidents and malfunctions; and identify a set of procedures to ensure a prompt response, notification, and cleanup in the event of a hazardous substance spill or a threat of a release. EC recommended that the plan be distributed to stakeholders and other interested parties, including EC.

HC recommended that emergency response plans consider events that could adversely affect the quality of the Ells River. These plans should include instructions to communicate immediately with groups and individuals that could be impacted by an event affecting the water quality of the Ells River.

6.8.3 Panel Conclusions and Recommendations

The Panel notes that TOTAL has the responsibility to ensure that it is fully prepared and capable of responding to any type of emergency arising from the project.

The Panel acknowledges that TOTAL has committed to developing, in consultation with relevant stakeholders, a comprehensive emergency response plan that identifies, describes, and evaluates the potential impact of all project-related accidents and malfunctions and identifies procedures to ensure prompt response, notification, and cleanup in the event of a hazardous substance spill or a threat of release. The Panel notes that TOTAL has committed to providing a copy of the plan to relevant stakeholders and any other interested parties.

The Panel expects TOTAL to meet this commitment and develop a comprehensive response plan consistent with ERCB *Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry*.

The Panel finds that with an effective emergency response plan in place, it is unlikely that significant adverse environmental effects would occur as result of accidents or malfunctions associated with the project.

7 CUMULATIVE ENVIRONMENTAL EFFECTS

The Panel's terms of reference directed it to focus the project's cumulative effects assessment on key valued environmental components. In its September 2008 request for additional information on this assessment, the Panel asked TOTAL to focus its assessment on the following valued environmental components:

- water quality and quantity;
- air quality;
- current use of lands and resources for traditional purposes by aboriginal persons; and
- wildlife and wildlife habitat for key species, such as indicator species and listed species.

7.1 Adequacy of the Cumulative Effects Assessment

OSEC, Sierra Club Prairie, and the Government of Canada raised the following concerns about the adequacy of TOTAL's cumulative effects assessment:

- whether the regional study area's extent for assessing effects on terrestrial components and hydrology was adequate;
- whether TOTAL should have assessed the cumulative effects related to forest fires and future forest harvesting;
- whether TOTAL should have included the Frontier and Equinox oil sands mines in the foreseeable projects that were considered in its cumulative effects assessment;
- whether TOTAL should have considered the content of the *Terrestrial Ecosystem Management Framework* proposed by CEMA.

7.1.1 Views of TOTAL

TOTAL noted that it conducted its cumulative effects assessment based on requirements in AENV's terms of reference for preparing the environmental impact assessment and on the Panel's additional information requests.

To conduct the cumulative effects assessment, TOTAL used the following scenarios:

- a baseline case (existing and approved projects at full build-out) to address project start up,
- an application case (existing projects, approved projects, and the Joslyn North Mine Project, all at full build-out with no reclamation), and
- a planned development case (existing, approved, and disclosed projects [including Joslyn] at full build-out with no reclamation).

At the request of the Panel, TOTAL also presented a pre-industrial disturbance case (the year 1965) to allow the determination of cumulative environmental effects of the project in combination with other projects or activities from before the proposed project.

7.1.1.1 Regional Study Area Selection

TOTAL assessed the cumulative effects in different regional study areas for each assessed environmental component (Figure 4). In response to criticism about the study area selected for wildlife, which has its eastern boundary as the Athabasca River, TOTAL argued that EC confirmed in its testimony that the Athabasca River was a reasonable ecological boundary for assessing impacts on wildlife. TOTAL further argued that even if the study area had been extended to the east side of the Athabasca River, the results of the assessment would remain essentially the same. TOTAL indicated that because it did not predict significant changes in water quality and hydrology in the Athabasca River, it considered the downstream boundary of the selected study area for fish appropriate and that extending the boundary further downstream to include the Athabasca River delta was unnecessary.

7.1.1.2 Consideration of Forest Fires and Future Forest Harvesting

TOTAL noted that it did not consider forest fires in its assessment of the planned development case because the modelling of future forest fires is speculative and cannot be spatially predicted on the landscape in a cumulative effects assessment with any certainty. TOTAL was of the opinion that including these effects would not change the assessment's conclusion; although fire can affect wildlife species, it is expected to be aggressively controlled in areas of intensive oil sands activity and including the effects of fires adds little information.

TOTAL asserted that it took into account the effects of forest harvesting in its cumulative effects assessment by considering existing and possible future mine projects. TOTAL said that Alberta Pacific Forest Industries Inc. (Al-Pac) would give priority to harvesting timber in forest management unit A15 (the unit comprising the mineable oil sands area) for the next 20 years to capture timber cleared for oil sands development. TOTAL argued that it did not include any forest harvesting past this timeline because placing a harvest plan on the landscape outside of the mineable oil sands area would be arbitrary and reduce the assessment's rigour by introducing inappropriate uncertainty in the modelling.

7.1.1.3 Exclusion of the Frontier and Equinox Projects

Regarding the exclusion of the Frontier and Equinox projects[32] from the planned development case assessment, TOTAL argued that it followed the Panel's request that the assessment "include all operating, approved, and applied-for in situ oil sands mineable projects and other projects such as quarries." TOTAL excluded these projects from its cumulative effects assessment either because they would be located outside of study areas or because an associated regulatory application, environmental assessment, or other detailed information were not available.

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[32] The Frontier and Equinox projects are two oil sands mines proposed by Silverbirch Energy Corporation/Teck. The projects would be located 25 kilometres and 35 kilometres north of the Joslyn North Mine Project, respectively, on the west side of the Athabasca River.

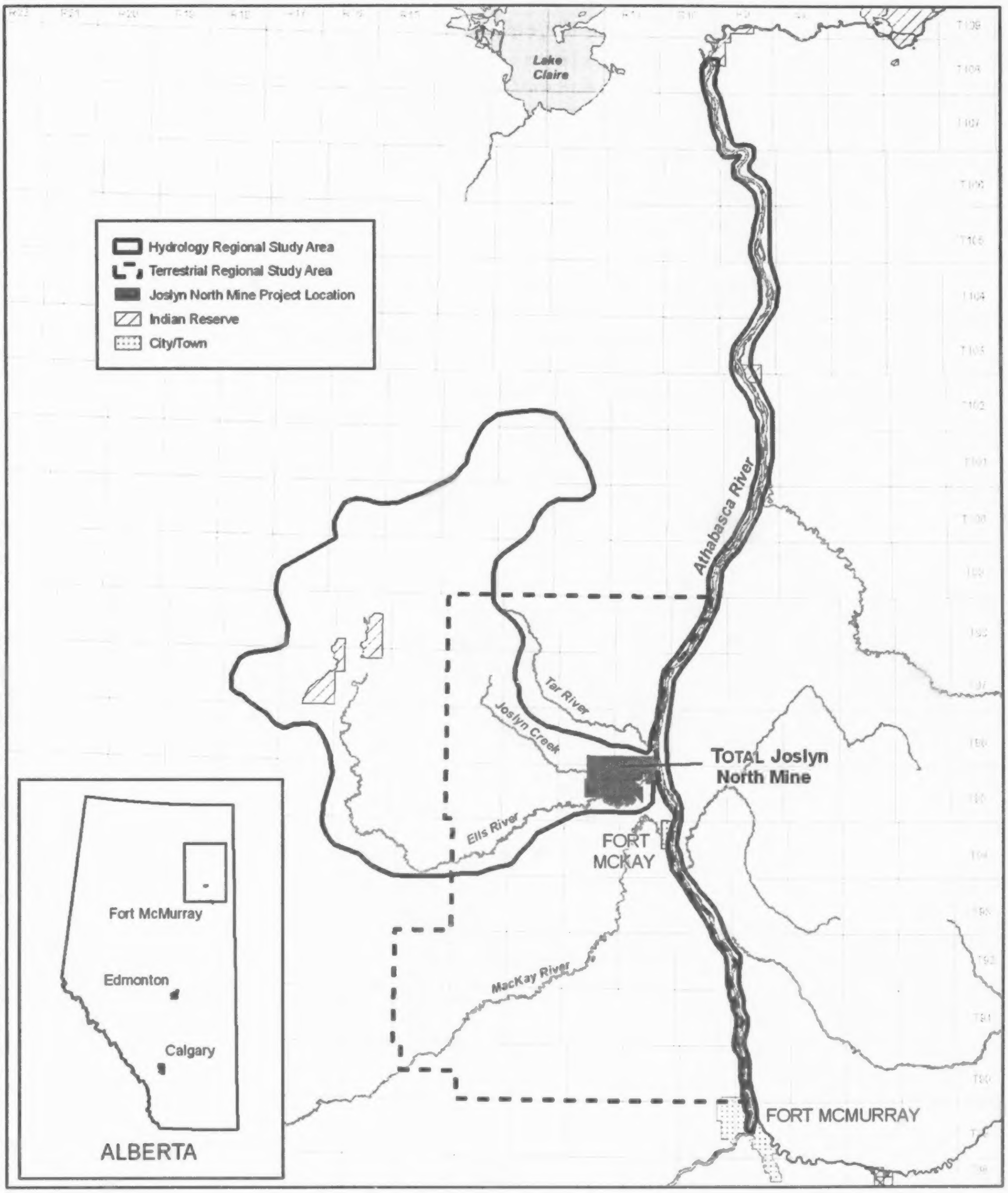
Lake Claire
Hydrology Regional Study Area
Terrestrial Regional Study Area
Joslyn North Mine Project Location
Indian Reserve
City/Town
Athabasca River
Tar River
Joslyn Creek
Ells River
TOTAL Joslyn North Mine
FORT MCKAY
MacKay River
FORT MCMURRAY
Fort McMurray
Edmonton
Calgary
ALBERTA
0
10
20
40
Kilometres

FIGURE 4

JOSLYN NORTH MINE PROJECT
HYDROLOGY AND TERRESTRIAL
REGIONAL STUDY AREAS

7.1.1.4 Integration of the Terrestrial Ecosystem Management Framework

Regarding the fact that TOTAL did not integrate the results of the *Terrestrial Ecosystem Management Framework*[33] into its cumulative effects assessment, TOTAL stated that it was not aware of any terms of reference that referred to the framework or to the need to integrate it into the assessment. TOTAL also noted that during the review of the environmental impact assessment, the provincial and federal agencies did not request that the cumulative effects assessment be redone using the framework. TOTAL further argued that the framework was a strategic regional planning framework for the entire area of the RMWB, an area 17 times larger than the project's regional study area. TOTAL noted that according to the framework, ecological integrity would be managed regionally and that management response triggers reflect average indicator values across the entire area of the RMWB. According to TOTAL, the framework anticipated that, in general, ecological indicators would remain within their natural range of variation in RMWB's protected areas, whereas in intensive development zones, the framework anticipated that indicators would fall well below their natural range of variation. TOTAL argued that the framework was never intended to be applied at a subregional level.

Overall, TOTAL argued that its cumulative effects assessment was comprehensive, robust, and conservative, and that it used data and approaches from every major project application in the oil sands over the past 10 years. TOTAL was of the view that OSEC's concerns were not material and did not invalidate the conclusions contained in TOTAL's environmental assessment.

7.1.2 Views of Interveners

7.1.2.1 Regional Study Area Selection

Oil Sands Environmental Coalition

OSEC noted that one of the "fatal errors" in TOTAL's assessment relates to the boundary selected for the regional study area. OSEC was of the view that when TOTAL updated its assessment, it should have assessed the zone of influence for the new proposed projects and determined if it overlapped with the project's zone of influence and if there was a potential for cumulative effects. OSEC noted that TOTAL admitted that the project would have at least an 11-kilometre zone of influence for some wildlife species and that the Athabasca River and Jackpine project (across the river) were in this zone.

Sierra Club Prairie

Sierra Club Prairie stated that, based on TOTAL's criteria for selecting its regional study area, the cumulative physical footprint would always be a relatively small percentage of the regional study area. Sierra Club Prairie presented an analysis by Peter Cizek who used an ecologically-delineated regional study area to calculate the percentage of physical footprints for oil sands and for communities. Using this approach, Sierra Club Prairie noted that in 5 out of 19 intersected soil landscapes in the baseline case, the critical threshold of 10 per cent habitat loss proposed by Sierra Club Prairie was already exceeded. In the planned development case, the critical threshold of 10 per cent habitat loss would be exceeded in 8 out of 19 intersected soil landscapes. Sierra Club Prairie argued that the project should not be approved given its evidence that cumulative habitat loss would be significant since the critical threshold of 10 per cent habitat loss would be exceeded under all cumulative development cases except the baseline case.

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[33] The *Terrestrial Ecosystem Management Framework* is CEMA's recommended approach to managing the cumulative effects of development and resource use on ecosystems and landscapes within the area of the RMWB.

Government of Canada

The Government of Canada recommended that future environmental impact assessments for oil sands projects include the Athabasca River delta in their cumulative effects assessments of fisheries and hydrology. In particular, Parks Canada described the ecological importance of the Athabasca River delta and noted that the delta is an area of significant sediment deposition and an area in the Regional Aquatic Monitoring Program focus study that is considered to have the potential to be affected by long-term development and to have been affected by other projects. In final argument, the Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175 said that they supported this recommendation.

7.1.2.2 Consideration of Forest Fires and Future Forest Harvesting

Oil Sands Environmental Coalition

OSEC argued that TOTAL's cumulative effects assessment was deficient because it failed to include the impacts of future forest fires and future forest harvesting activities. It noted that once the timber was harvested from the mineable oil sands area, there would still be another 22 townships in the regional study area that TOTAL will not have considered in its assessment. In response to TOTAL's argument that Al-Pac did not have a harvest plan beyond five years, OSEC noted that a CEMA database shows the harvesting spatially and volumetrically for the next 200 years based on Al-Pac's annual cut.

OSEC argued that TOTAL was required to take forest fires into account when preparing its environmental impact assessment because the terms of reference for the environmental impact assessment issued by AENV identify forest fires as one of the biophysical activities that could interact with the project. OSEC was of the view that the evidence was conclusive that fires can be modelled spatially and otherwise. OSEC submitted that CEMA completed such a fire modelling and that the tools to do so were available.

OSEC noted that it could not determine if evaluating the effects of future forest harvesting and fires would have made a significant difference in the cumulative effects assessment results. However, OSEC indicated that based on the forestry data filed, harvesting was known to occur on 4600 hectares a year in the regional study area for the next 20 years at least, and beyond. OSEC submitted that it was also known, based on the fire data filed during the hearing, that forest fires burn 5000 hectares per year in the regional study area and that both forestry and fires preferentially hit old growth forest, resulting in the transformation of the landscape over time from old growth to new growth. OSEC indicated that this would adversely affect species that depend on old growth forest, such as some fur bearers, woodland caribou, and other species at risk.

7.1.2.3 Exclusion of the Frontier and Equinox Projects

Equinox and Frontier mines, OSEC stated that the terms of reference issued by AENV Regarding the proposed mentioned that the planned development case should include existing and anticipated future environmental conditions, existing projects or activities, and other planned projects or activities. OSEC further noted that "planned" is defined in the terms of reference as

> any project or activity that has been publicly disclosed prior to the issuance of the terms of reference or up to six months prior to the submission of the project Application and EIA [environmental impact assessment] report, whichever is submitted sooner.

OSEC noted that the Equinox and Frontier mines were officially announced in a formal public disclosure document posted on the environmental assessment registry. With respect to TOTAL's suggestion that these mines are too speculative, OSEC argued that it was quite clear, based on evidence that OSEC filed, the major impacts for mines of this nature could be calculated and determined. It noted that CEMA, in its *Terrestrial Ecosystem Management Framework*, used a production scenario from the Alberta Department of Energy to assess potential impacts.

7.1.2.4 Integration of the Terrestrial Ecosystem Management Framework

Fort McKay First Nation and Métis Nation Local #63

In its closing argument, Fort McKay noted that it supported the *Terrestrial Ecosystem Management Framework*. It further noted that the framework recommended management actions that should be immediately taken to protect wildlife and that those actions were not being taken.

Oil Sands Environmental Coalition

OSEC was of the view that TOTAL's cumulative effects assessment failed to take into account the work of relevant regional studies conducted by the governments of Alberta and Canada and proponents through CEMA and the *Terrestrial Ecosystem Management Framework* developed by CEMA. OSEC believed that the framework presents a more realistic assessment of cumulative impacts in the RMWB. It submitted that TOTAL's environmental impact assessment did not consider these highly relevant impacts or the framework's management objectives for wildlife. OSEC noted that the framework used scientific information based on historic norms for forest fires to model impacts. OSEC also noted that the framework shows that the current oil sands trajectory is unsustainable and that major changes in land management policy are required to meet the framework's proposed wildlife management objectives. OSEC was of the view that the framework was more credible than TOTAL's assessment and that the framework's results and methodologies should have informed a credible assessment and discussion by TOTAL.

Finally, OSEC pointed out that past panels have recognized the importance of CEMA and CEMA's frameworks and have noted the need for clear regional objectives and a clear vision concerning oil sands development.

7.1.3 Panel Conclusions and Recommendations

7.1.3.1 Regional Study Area Selection

The Panel notes that TOTAL followed the good practice of assessing the cumulative effects within different regional study areas for each assessed environmental component. In response to criticism about the study area—the eastern boundary of which is the Athabasca River—that TOTAL selected for wildlife, the Panel notes that EC took the position that the Athabasca River was a reasonable ecological boundary to assess impacts on wildlife. Based on the evidence provided, the Panel also concludes that even if TOTAL had included the area east of the Athabasca River in its study area, the assessment's results would have remained essentially the same, as demonstrated by evidence filed by TOTAL and other interveners. In this regard, the

Panel notes that, based on the results in Mr. Cizek's report (submitted on behalf of Sierra Club Prairie), the cumulative footprint for the planned development case using either TOTAL's regional study area or the enlarged regional study area proposed by Mr. Cizek would result in about the same percentage of footprint affected by development.

However, notwithstanding the results of the assessment in this case, the Panel is of the view that in establishing a regional study area for vegetation, wildlife, and biodiversity, it is more helpful to select one that offers the most comprehensive picture of cumulative effects reasonably possible.

With respect to including the Athabasca River delta in the regional study area, the evidence presented shows that the project would not lead to significant changes in water quality and hydrology in the Athabasca River and that extending the boundary further downstream is not necessary. Nevertheless, the Panel notes the concerns expressed by certain interveners regarding observed impacts on fish and hydrology of the Athabasca River, the ecological importance of the Athabasca River delta, and the potential for it to be affected by long-term development in the region. In particular, the Panel notes that Parks Canada indicated the Athabasca River delta as an area in the RAMP focus study with the potential to be affected by long-term development. The Panel is not in a position to determine if the regional study area selected for the environmental assessment of future projects should include the Athabasca River delta or not. The Panel believes that the extent of the regional study area assessed for water quality and hydrology should be determined by how far downstream effects are likely. The Panel is of the view that AENV should address this question, with input from others, in future terms of reference issued for other proposed projects that may affect the Athabasca River.

Based on all of the foregoing, the Panel is of the view that although TOTAL did not select a larger study area to assess the cumulative effects on wildlife, hydrology, and water quality, the assessment, combined with the evidence filed by interveners, allows the Panel to determine the potential cumulative effects on key valued environmental components with sufficient confidence.

7.1.3.2 Consideration of Forest Fires and Future Forest Harvesting

The Panel notes that there are uncertainties in estimating the magnitude of effects from future forest fires and future forest harvesting. However, the Panel also notes that rather than discounting them, better practice would have been to assess their magnitude using, for example, CEMA's framework, to better understand potential cumulative effects since such activities can affect terrestrial habitat and wildlife. The Panel believes that OSEC's evidence demonstrated that TOTAL could have conducted a useful cumulative effects assessment which would have included the effects from wildfires and harvesting; an assessment including such effects would have permitted a better analysis of impacts and mitigation options (Sections 7.2 to 7.6 for the Panel's findings on the cumulative effects on key valued components).

7.1.3.3 Exclusion of the Frontier and Equinox Projects

At the outset of the hearing, OSEC motioned for the Panel to compel TOTAL to assess the potential effects of the Frontier and Equinox projects in its cumulative effects assessment. On the basis of the evidence provided and the arguments made by OSEC and TOTAL, the Panel concluded that OSEC did not demonstrate that these two projects were sufficiently likely or reasonably foreseeable to require TOTAL to incorporate their potential effects into its cumulative effects assessment. While OSEC was entitled to pursue the issue further during the hearing, the Panel did not receive further evidence or argument to cause it to arrive at a different conclusion.

7.1.3.4 Integration of the Terrestrial Ecosystem Management Framework

The Panel is concerned that TOTAL—a member of CEMA—did not take into account the applicable methodologies, results, and triggers discussed in the *Terrestrial Ecosystem Management Framework*. In the absence of any other guidelines or thresholds, the Panel finds that it would have been particularly relevant and useful for TOTAL to use the framework to better inform its cumulative effects assessment on terrestrial components. The Panel recognizes the importance of CEMA's work on the cumulative effects in the oil sands region. The Panel recognizes that the framework was prepared in the context of the geographic area of the RMWB rather than in the context of a project cumulative effects assessment, such as the assessment TOTAL was required to do.

The Panel finds that some of the triggers discussed under the framework could have been useful as thresholds to determine what to consider as a significant effect for some wildlife species. (Section 7.2.3 for the Panel's further discussion on some of the framework's results and recommendations.)

Overall, the Panel finds that TOTAL's cumulative effects assessment, together with the information provided at the hearing, is sufficient for the Panel to make its determination about the significance of cumulative effects; however, the improvements noted in this section would have made the assessment more accurate and better assisted the Panel in reaching its conclusions.

7.2 Wildlife and Wildlife Habitat

7.2.1 Views of TOTAL

TOTAL assessed the project's cumulative effects on wildlife, including wildlife species important to First Nations' traditional practices, on a regional basis. In final argument, TOTAL indicated that when changes in habitat availability are evaluated from a pre-industrial condition to the application case, the remaining habitat for non-listed wildlife species would range from 67 per cent to 84 per cent. For species listed under the *Species at Risk Act*, the remaining habitat would range from 74 per cent to 92 per cent relative to pre-industrial conditions, well within the 60 per cent remaining habitat threshold TOTAL selected to define what would cause a significant effect on wildlife. TOTAL stated that even if it had used modelling approaches that are different from those used for the *Terrestrial Ecosystem Management Framework*, the magnitude of this cumulative change was within the framework's predicted range of change for common indicator species.

The Panel asked TOTAL to provide three regional wildlife population estimates: for predisturbance (1965), project start-up, and 2037. TOTAL's analysis concluded that wildlife populations in the regional study area have already declined an average of 19 per cent relative to pre-industrial conditions (ranging from a loss of 9 per cent for beaver to 37 per cent for moose). TOTAL noted that these declines were based solely on estimated changes in wildlife habitat, including direct losses from industrial footprints and indirect losses in adjacent zones of influence from sensory disturbance. According to TOTAL's analysis, the project would result in an additional 1 per cent reduction in wildlife populations (not including species at risk) in the regional study area relative to the pre-industrial case. TOTAL concluded that the cumulative effects of all existing, approved, and disclosed projects (including the Joslyn North Mine Project), assuming full build-out and no reclamation, would result in reductions in wildlife populations ranging from 19 per cent (beaver) to 44 per cent (moose) relative to pre-industrial conditions.

TOTAL considered that the estimated declines were conservatively high because habitat loss does not necessarily equate to animal losses, as animals displaced from disturbed areas could successfully relocate to adjacent areas. TOTAL added that its estimates of habitat loss assumed simultaneous full build-out of all known and planned developments within the regional study area, without the benefits of reclamation. TOTAL concluded that the regional study area would be able to sustain viable populations of these species with the predicted planned development, and the effects of the project, in combination with other proposed developments, would not be significant.

TOTAL concluded that populations of wildlife species listed under the *Species at Risk Act* have already declined an average of 22 per cent relative to pre-industrial conditions in the regional study area (ranging from 1 per cent for common nighthawk to 30 per cent for Canada warbler and western toad). TOTAL based estimates of the declines solely on estimated changes in the habitat of these listed species, including direct losses from industrial footprints and indirect losses in adjacent zones of influence from sensory disturbance. TOTAL predicted that the planned development case would result in reductions in listed wildlife populations ranging from 14 per cent (common nighthawk) to 39 per cent (Canada warbler) relative to pre-industrial conditions.

7.2.2 Views of Interveners

Mikisew Cree First Nation (Untested Evidence)

On behalf of MCFN, Management Solutions in Environmental Science (MSES) analyzed satellite photographs of the region together with government records of surface development. MSES found that the project's impacts, combined with past, present, and future projects, would remove remaining undisturbed land from the regional study area by about 2021. Within ten years of 2021, the habitats for moose, beaver, and waterfowl would be removed and, as a result, their populations in the regional study area would likely not be viable. MSES concluded that if current development patterns continue, categories of habitat and associated animal populations would be lost from the area entirely. The level of fragmentation of the land is already extremely severe. MSES noted that all of this is associated with an observed reduction in the populations of animals harvested by MCFN.

MCFN recommended that the provincial and federal governments use a terrestrial no-net-loss policy when considering disturbance. MCFN further recommended predisturbance baseline studies, including determining the natural range of variation for wildlife populations prior to further industrial activity.

MCFN noted specific concerns regarding two species at risk that are important to its traditional way of life. It recommended that development of federal recovery plans that would identify critical habitat for wood bison and woodland caribou be accelerated because these species are important to its members' traditional way of life.

Fort McKay First Nation and Métis Nation Local #63 (Untested Evidence)

Fort McKay expressed concern about the large reduction in wildlife populations in both the local study area and the regional study area. Fort McKay indicated that its community members were concerned about the project's contribution to declines in the population and health of several species, such as moose, rabbit, porcupine, beaver, bear, deer, lynx, fox, fisher and other fur bearers.

Fort McKay filed a moose survey from SRD that noted the population of moose has declined by 60 per cent within wildlife management unit 531 between 1994 and 2009, providing an indication of the cumulative effects of human activities on moose in the region. Fort McKay added that this survey confirms the observations of people who live in Fort McKay and demonstrates that TOTAL may have underestimated the impacts on all wildlife species populations.

Fort McKay expressed concern about declining woodland caribou populations in the oil sands region. Fort McKay noted that one study by the Athabasca Landscape Team (2009) indicated that boreal caribou populations in the oil sands region could disappear within two to four human generations. This report recommended that new management zones be established to help preserve caribou populations, and these zones include a part of TOTAL's site.

Fort McKay stated that TOTAL should have assessed impacts on woodland caribou populations because TOTAL identified caribou habitat in the local study area and indicated that it had received traditional knowledge that caribou had occupied the area.

Athabasca Chipewyan First Nation (Untested Evidence)

ACFN noted its concerns about the already diminished populations of wildlife. It stated that the landscape changes observed have diminished the populations of muskrat and moose. ACFN noted that wood bison and woodland caribou have already been extirpated in the regional study area. Its members have noted the absence or decline of some species, including insects. ACFN also noted abnormalities in moose meat. It expressed concern that if development proceeds at the current rate, the moose population would cease to be viable within the regional study area between 2015 and 2019; the beaver habitat would be eliminated from the regional study area by 2025; and no waterfowl habitat would remain in the regional study area by 2029.

ACFN raised concerns about the absence of recovery strategies for woodland caribou and wood bison. ACFN recommended that the federal government issue an emergency order under the federal *Species at Risk Act* protecting the habitat of woodland caribou in northeastern Alberta from further development. ACFN recommended identifying critical habitat for wildlife species at risk within their traditional lands so those areas could be protected from further development.

Oil Sands Environmental Coalition

Based on the results of the *Terrestrial Ecosystem Management Framework*, OSEC noted that there is currently, or will soon be, a problem with some species populations dropping below their natural range of variation. OSEC said it was important to note that the *Terrestrial Ecosystem Management Framework* recommended immediate management action to reverse the declines of some species. OSEC stated that since these recommendations have not been implemented, it presumed that those declines were continuing. OSEC added that it is important to note that the red condition as defined in the *Terrestrial Ecosystem Management Framework* means that species are or will be 20 per cent below the lower limit of their natural range of variation by 2022, well within the life of the Joslyn mine.

OSEC submitted that TOTAL provided no studies or information to show that the regional study area would be able to supply the additional wildlife or species at risk that might be affected. OSEC was also of the view that the Panel cannot use the Vision document[34] to conclude that there is an intensive zone in which there is no need to worry about ecological values for areas proposed for intensive mining, as suggested by TOTAL.

OSEC was of the view that CEMA, which was supposed to be developing management frameworks to monitor and control cumulative effects, cannot be used as a mitigation strategy because it resulted in a lack of timely and substantial product, and it does not have the backing of government. OSEC stated that doing research and just talking about it in groups is not mitigation.

Sierra Club Prairie

Sierra Club Prairie stated that reductions in habitat of up to 39 per cent for wildlife species would be significant, especially if a 10 or 20 per cent critical threshold is used. It pointed out that a 20 per cent threshold has been used in previous assessments of oil sands projects. Sierra Club Prairie also stated that there is an evident lack of understanding by TOTAL of the meaning of "cumulative effects" or the purpose in identifying them. Sierra added that despite the fact that TOTAL identified significant regional cumulative effects that already exist or are anticipated, TOTAL has repeatedly asserted that the relatively small magnitude of the project's additional contributions or effects is sufficient grounds to ignore these effects in the context of cumulative impacts.

Mike Guertin

Mr. Guertin expressed concern that wildlife studies are initiated after some development, such as test holes, has already occurred in an area. He also indicated that he no longer sees as much wildlife in the area. Mr. Guertin suggested that the trapping industry would like the oil sands developers to employ local trappers to help with wildlife studies.

Government of Canada

EC indicated that it had broad concerns about cumulative effects on air, water, and wildlife, including biodiversity, in the oil sands area. EC stated that as a rule, these concerns cannot be addressed adequately through individual project reviews. It submitted that the need to address cumulative effects regionally requires that all levels of government, proponents, and stakeholders cooperate to coordinate actions to minimize and mitigate risks, monitor effects, and manage consequences of development. EC stated that the development of the Lower Athabasca Regional Plan and its frameworks was an important step in the management of cumulative effects in the Lower Athabasca Region. EC asked that the Panel recognize and convey the significance of the Lower Athabasca Regional Plan process as a vehicle for designating permanent habitat for species at risk and for providing source habitat for recolonization in the oil sands area. EC recommended that the natural range of variation for wildlife species in the area of the RMWB be maintained rather than use a threshold of 10 per cent below the lower limit of their natural range of variation.

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[34] A document issued in August 2010 by the Lower Athabasca Regional Advisory Council entitled *Advice to the Government of Alberta – Regarding a Vision for the Lower Athabasca Region.*

On the issue of habitat connectivity and corridors, EC noted that as development continues to spread across the landscape, habitat becomes increasingly fragmented, movement of wildlife becomes more difficult, and cumulative effects become more prominent. EC was of the view that wildlife movement corridors in the form of linear enclaves of undisturbed habitat can effectively maintain habitat connectivity and facilitate genetic mixing and continued dispersal of wildlife until habitats are successfully reclaimed. EC noted that as operations to the south of the project intensify, the Ells River valley can be expected to become more important as a wildlife refuge and movement corridor. EC recommended that TOTAL, in partnership with other companies, collect baseline data on wildlife use of the river valley and adjacent upland habitats and study wildlife use of corridors that have been, or will soon be, created during oil sands mine construction.

7.2.3 Panel Conclusions and Recommendations

As noted in Section 6.1.3, the Panel does not agree with the threshold established by TOTAL—60 per cent remaining habitat—to determine what would cause a significant cumulative effect on wildlife and wildlife habitat, including species at risk. The Panel believes that the (untested) evidence presented by Fort McKay regarding a SRD moose survey in wildlife management unit 531 (an area of about 17 000 square kilometres northwest of Fort McMurray that encompasses the regional study area for wildlife) showed an interesting result. The SRD survey showed a 60 per cent decline in moose in this area between 1994 and 2009, which may indicate that the cumulative effect of human activities in the region has already contributed to a decline that most (including TOTAL, according to its stated criterion) would say is significant and adverse. Because this evidence was not tested, the Panel affords it little weight.

In part for this reason and for the reasons indicated in Section 6.1.3, the Panel believes a more precautionary threshold of 20 per cent loss of habitat as an indicator of significance of effects on valued wildlife is appropriate. For species at risk, the Panel is of the view that any net harm (negative impact) to an individual of the species, its residence, or its critical habitat would constitute a significant adverse effect.

To assess cumulative effects, loss of wildlife habitat should be "assessed" or "considered" from the pre-industrial case in order to capture the full effects of past and existing projects. In its updated application, TOTAL based its assessment against the baseline case. For this reason, the Panel asked TOTAL to also examine regional wildlife population estimates from the pre-industrial case to the planned development case. Tables 7 and 8 summarize the information provided by TOTAL. From this information, the Panel understands that a decline in available habitat of over 20 per cent for all indicator species and species at risk (except for the American beaver and the common nighthawk) is expected in the planned development case compared with the pre-industrial case in the regional study area. Compared to the thresholds for significance of effects that the Panel believes is appropriate, these cumulative effects on valued wildlife and species at risk would be significant and adverse.

The Panel notes that the *Terrestrial Ecosystem Management Framework* recommends that specific thresholds trigger management responses for specific environmental indicators (e.g., index of native fish integrity, woodland caribou, moose, fisher, old growth birds, black bear, and area of old-growth forest). The Panel is of the view that species categorized by CEMA to be in the red[35] or yellow[36] condition could be construed to be already affected significantly by various activities and developments within the area of the RMWB. The Panel notes that fisher and black bear habitat were categorized by CEMA as in the "yellow condition". TOTAL identified these two species as valued species. The Panel is concerned that the project and other future projects and activities would further reduce habitat for fisher and black bear. The Panel is therefore of the view that it is particularly important for these valued species that TOTAL further reduce the effects of its project as suggested in Section 6.1.3.

The Panel believes that the *Terrestrial Ecosystem Management Framework* provides useful ways to manage cumulative effects on wildlife within the area of the RMWB. The Panel agrees with EC that the Lower Athabasca Regional Plan and its frameworks could be important tools for managing cumulative effects in the Lower Athabasca Region. The Panel recommends that SRD use the Lower Athabasca Regional Plan process to protect key habitats for species at risk and to provide source habitat for species recolonization in the oil sands area. The Panel also recommends that recommendations made by CEMA in the *Terrestrial Ecosystem Management Framework* be considered by the Government of Alberta for inclusion in the Lower Athabasca Regional Plan. For example, the Lower Athabasca Regional Plan process could consider protecting key habitat for species at risk and providing source habitat for species recolonization in the oil sands area.

The Panel further notes that the mitigation measures required for project effects could also be used, in collaboration with other industry players, to manage these cumulative effects.

For the reasons identified in Section 6.1, more wildlife mitigation would be necessary for the Panel to conclude that the adverse cumulative effects on valued wildlife and species at risk would not be significant. The Panel believes that the mitigation measures suggested in Section 6.1.3 in the wildlife mitigation plan would also help mitigate cumulative effects on wildlife. Evaluating the proposed new wildlife mitigation plan would require wildlife expertise that is found in SRD and in EC. The Panel recommends that SRD, in consultation with EC as appropriate, work with TOTAL before project authorization to ensure that additional mitigation, such as off-site offsets, avoidance of high-quality habitat, and research be identified to ensure that the new wildlife mitigation plan not only deals with mitigating impacts on species at risk and valued wildlife, but also reduces the overall cumulative effects to wildlife. The Panel expects that in order for the new wildlife mitigation plan to serve this dual role, it would need to include off-site offsets that are of a sufficient size to manage the cumulative effects on valued wildlife and species at risk.

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[35] An indicator is determined to be in a "red condition" when monitoring measures it at more than 20 per cent below the lower limit of the natural range of variation, or when modelling predicts that it will drop to this level within 15 years across the entire RMWB.

[36] An indicator is determined to be in a "yellow condition" when either monitoring measures it at 10-20 per cent below the lower limit of the natural range of variation, or when modelling predicts that it will drop more than 10 per cent below the lower limit of the natural range of variation within 30 years across the entire RMWB.

To further reduce cumulative effects on breeding migratory bird species and because cumulative effects require cumulative solutions, the Panel also recommends that SRD require that forest harvesting within the regional study area be done outside of the migratory bird breeding season (i.e., from April 1 to August 31).

Taking into account implementation of the above recommendations as well as TOTAL's proposed mitigation measures and commitments, the Panel concludes that significant adverse cumulative environmental effects on wildlife likely to occur from the project in combination with other projects or activities that have been or will be carried out, would result in no net significant adverse effect on wildlife.

Table 7. Wildlife Population Estimates in the regional study area[37]

Species	Pre-industrial (1965)		Planned development case		Percent reduction	
	Habitat available (km²)	Population estimate	Habitat available (km²)	Population estimate	Habitat available (%)	Population estimates (%)
Moose	3580	1305	2613	736	-27	-43
Black bear	3580	1384	2732	979	-23	-29
Fisher	3580	297	2732	212	-23	-29
Canada lynx (peak)[38]	3423	1108	2613	820	-23	-26
Canada lynx (low)	3423	85	2613	63	-23	-26
Snowshoe hare (peak)	3423	3 763 600	2603	2 855 800	-24	-24
Showshoe hare (low)	3423	136 750	2603	103 370	-24	-24
American beaver	4338	13 193	3541	10 642	-18	-19
Ruffed grouse	2021	28 430	1496	20 840	-26	-27
Northern goshawk	2175	259	1514	175	-30	-32
Great grey owl	2828	7886	2119	5824	-25	-26

Table 8. Population Estimates in the regional study area for species listed under the *Species at Risk Act*[39]

Species	Habitat quality/class	Pre-industrial (1965)		Planned development case		Percent reduction	
		Habitat available (km²)	Population estimate	Habitat available (km²)	Population estimate	Habitat available (%)	Population estimates (%)
Yellow rail	High	68	1088	45	736	-33	-32
	Total	68	1088	45	736	-34	-32
Short-eared owl	High	46	124	28	76	-39	-39
	Total	1245	1310	873	914	-30	-30
Common nighthawk	High	224	4928	196	4312	-13	-13
	Total	1730	14 500	1448	12 498	-16	-14
Olive-sided flycatcher	High	3	60	2	40	-33	-33
	Total	1209	6012	826	4132	-32	-31
Canada warbler	High	784	47 040	443	26 580	-43	-43
	Total	2282	68 807	1561	42 302	-32	-39
Rusty blackbird	High	1674	50 220	1175	35 250	-30	-30
	Total	2025	53 301	1572	38 839	-22	-27
Western toad	High	707	7070	436	4360	-38	-38
	Total	2989	20 708	1986	13 078	-34	-37

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[37] Adapted from Table 5-1, Exhibit 001-052

[38] TOTAL noted that determining population estimates for Canada lynx and snowshoe hare is problematic because of the linked population cycles between these two species, as lynx are obligate predators of snowshoe hare. Overall, hare populations in the northern boreal forest peak about every 10 years, with population densities changing 2- to 200-fold. Lynx populations exhibit a delayed density-dependent cycle, lagging 1-2 years behind that of hares, with population densities changing 3- to 17-fold during one cycle. To better represent the variation in population dynamics in the regional study area, TOTAL provided a density estimate for both population peaks and population lows.

[39] Adapted from Table 20-2, Exhibit 001-054

7.3 Water Quantity

7.3.1 Views of TOTAL

TOTAL stated that the main sources of water for the project include the Athabasca River, site precipitation runoff, and seepage collected in the closed-circuit drainage system. TOTAL estimated a maximum water requirement of 26.4 million cubic metres during 2018. To meet this need, TOTAL indicated that it would withdraw a maximum volume of 22 million cubic metres annually from the Athabasca River. The on-site runoff water collection system would provide the additional 4.4 million cubic metres required. TOTAL stated that the peak annual withdrawal amount was equivalent to 0.11 per cent of the mean annual flow rate of 644 cubic metres per second in the Athabasca River and 0.69 per cent of the 7Q10[40] low flow of 102 cubic metres per second.

TOTAL stated that the project's maximum annual withdrawal represents about 5.2 per cent of the net water allocated for existing and approved mineable oil sands developments and the proposed project. In turn, these net water allocations correspond to 2.1 per cent of the mean annual flow in the Athabasca River.

In response to concerns raised about the lower water levels on the Athabasca River and in the Athabasca River delta and the difficulty to navigate, TOTAL argued that the decreasing water levels within the delta are not solely related to the flow within the Athabasca River. TOTAL submitted that many of these effects were related to back-flooding from the Peace River and to other factors, such as the natural movement of sands and the fact that the river is no longer dredged.

TOTAL stated that the average flow of the Athabasca River was decreasing and that the catchment basin feeding into the river may be associated with this decrease. TOTAL indicated that there was not any apparent change in its flow during the winter. TOTAL stated that implementing the Water Management Framework would manage changes during low flow conditions in the Athabasca River. In addition, TOTAL noted that its off-stream storage pond would minimize the effect on the flow of the Athabasca River during winter (low flow) conditions. TOTAL stated that it derived flow statistics for the Athabasca River from recorded flows downstream of Fort McMurray from 1958 to 2007.

TOTAL stated that the project's water intake, located on the west side of the Athabasca River, would accommodate the needs of the project and potential future mine development. The pumping capacity would be 5040 cubic metres per hour to satisfy the peak annual river water demand for both the project and the off-stream storage pond. TOTAL noted that the off-stream storage pond would provide a continuous 90-day water supply for the project during water withdrawal restrictions for the Athabasca River required by the *Phase II Water Management Framework* for the lower Athabasca River.[41] TOTAL indicated that it would submit additional information on the design of the river water intake in applications and documents to DFO and AENV.

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[40] The lowest seven-day consecutive flow that occurs on average, once every 10 years.

[41] On February 4, 2010, CEMA announced that it completed the *Phase II Water Management Framework* recommendation for the lower Athabasca River and forwarded it to provincial and federal regulators. The *Phase II Water Management Framework* will take effect on January 1, 2011. Full implementation will take place in 2016.

TOTAL committed to adhering to the intentions of the *Phase II Water Management Framework*, including no water withdrawals from the Athabasca River during low flow conditions. TOTAL stated that it would support the development of and participate in the implementation of a monitoring program focusing on cumulative effects assessment of water withdrawals from the Athabasca River. TOTAL also committed to actively participate in regional oil sands multistakeholder committees, such as CEMA, the Canadian Oil Sands Network for Research and Development (CONRAD), RAMP, and collaborative industry initiatives.

TOTAL stated that implementing the *Phase II Water Management Framework* would limit the cumulative effects of water withdrawals on the Athabasca River flows. TOTAL concluded that the predicted cumulative changes to hydrologic indicators would be insignificant.

7.3.2 Views of Interveners

Mikisew Cree First Nation and Athabasca Chipewyan First Nation (Untested Evidence)

MCFN stated that it was concerned with substantial water withdrawals from the Athabasca River during low flow conditions. MCFN requested that the Government of Canada establish a comprehensive and transparent monitoring program for water flows in the Lower Athabasca River Basin.

MCFN recommended that the Government of Alberta alter water permits to existing mines to lower and cap the peak water withdrawal allocated by the oil sands industry from the lower Athabasca River. Similarly, MCFN recommended to the governments of Canada and Alberta that they immediately implement a precautionary base flow for the Athabasca River of 100 cubic metres per second and restrict withdrawals at or below this flow.

ACFN indicated that the Athabasca River is the lifeblood of its traditional lands and essential for sustaining the identity, culture, and well being of ACFN members. The river provides access to traditional hunting, trapping, fishing, and gathering areas and supports the traditional resources required for the meaningful exercise of ACFN's rights.

ACFN stated that there are a number of issues, such as unaddressed implications of climate change, with the *Phase II Water Management Framework*. ACFN suggested that TOTAL address these issues to protect ACFN's aboriginal and treaty rights. ACFN stated that Phase II of the framework did not incorporate current knowledge on the Delta and was not representative of the Delta itself.

MCFN and ACFN stated that access through the Peace-Athabasca delta to traditional lands, cabins, and traditional foods are highly dependent on water levels. MCFN and ACFN stated that low water levels have reduced traditional resources and reduced or eliminated access to many traditional resource sites.

Fort McKay First Nation and Métis Nation Local # 63 (Untested Evidence)

Fort McKay raised concerns about the adverse impacts of water withdrawals from the Athabasca River during low flow conditions. Fort McKay recommended that the raw water intake be shutdown during low flow conditions to comply with the *Phase II Water Management Framework*.

Oil Sands Environmental Coalition and Sierra Club Prairie

OSEC stated that the project, combined with existing, approved, and planned developments, would adversely impact the lower Athabasca River during low flow conditions in winter. OSEC and Sierra Club Prairie contended that because TOTAL used either current or historical average flows to predict the impacts of future water extractions without considering declining trends in the Athabasca River flows, the risk of overestimating the amount of water during periods of low flow increased.

OSEC and Sierra Club Prairie stated that TOTAL did not provide information on the sensitivity or accuracy of the model, quantification of the model errors, statistical foundations, model's confidence limits, and the variability inherent to the model's output. This lack of information led OSEC and Sierra Club Prairie to conclude that TOTAL's hydrologic model prediction was inaccurate.

OSEC and Sierra Club Prairie stated that if the proposed Phase II ecosystem base flow of 87 cubic metres per second remains current over the next 10 to 15 years, it could result in restrictions to water withdrawals for every winter month. Statistical analysis carried out by OSEC and Sierra Club indicated that historical trends were declining. OSEC and Sierra Club Prairie indicated that if these historical trends continue, the January, February, and March flows would decrease below the Phase II ecosystem base flow in two, 10, and 14 years, respectively. OSEC and Sierra Club Prairie concluded that the water management frameworks excluded temporal trends and assumed that future flows in the Athabasca River would be similar to historical flows. This assumption would result in an underestimation of the potential impact of existing, approved, proposed, and future large scale water withdrawals for industrial purposes from the Athabasca River.

Government of Canada

DFO noted that the successive elimination of watercourses and cumulative water withdrawals from the lower Athabasca River watershed would affect regional fish habitat quantity and quality. DFO further indicated that disturbing large numbers of small channels may change temperature regimes, peak flow hydrology, sediment supply and routing, the timing of organic matter inputs, and reduce habitat availability. DFO noted that there was uncertainty about how regional impacts would affect the productivity of the lower Athabasca River watershed.

DFO stated that the project would impact surface and subsurface water flow regimes. It noted that a reduction in stream flows may impact water quality conditions, spawning, rearing, feeding, migration, and overwintering habitats for fish. DFO indicated that the most extreme low flow conditions generally occur in winter. DFO stated that it would apply the principles laid out in the *Phase II Water Management Framework* and DFO's habitat policy to the project. DFO recommended that TOTAL support the development of and participate in the implementation of a monitoring program focusing on cumulative effects assessment of water withdrawals.

DFO stated that it was working with AENV to develop the *Phase II Water Management Framework*. The framework suggested an ecosystem base flow of 87 cubic metres per second. DFO stated that it did not expect any significant effects on the aquatic environment with this ecosystem base flow. DFO stated that it is working through CEMA to develop a monitoring program to address uncertainties regarding the proposed ecosystem base flow.

EC stated that the *Phase I Water Management Framework* for the Athabasca River provided adequate operational withdrawals and minimized the risk on the ecosystem. EC asserted that experience obtained by implementing Phase I would assist in future refinement and updating of Phase II. EC acknowledged TOTAL's commitment to comply with the framework for the lower Athabasca River and its plan to construct the off-stream storage pond for minimizing water withdrawals during low flow periods.

7.3.3 Panel Conclusions and Recommendations

The Panel acknowledges the efforts of the governments of both Canada and Alberta and other stakeholders working through CEMA to develop recommendations for the *Phase II Water Management Framework*. It notes that the governments of Canada and Alberta are currently working with CEMA's Surface Water Working Group to develop the most appropriate monitoring program to address concerns with respect to the selected 87 cubic metres per second ecosystem base flow. Based on evidence provided, the Panel understands that Phase II proposes maximum cumulative withdrawals from the Athabasca River of 4.4 cubic metres per second at or below the ecosystem base flow, which allow Suncor and Syncrude to withdraw 2 cubic metres per second each and the Shell Muskeg River Mine and CNRL Horizon Mine to withdraw 0.2 cubic metres per second each.

The Panel understands that Phase II's progressive implementation will commence in January 2011 and be fully operational in January 2016. The Panel considers that the proposed *Phase II Water Management Framework* and subsequent adaptive management measures would address potential issues related to water withdrawals during low flow conditions. The Panel understands that since the mid-1970s, the Athabasca River's average flow has been dropping and that it is one of the concerns that is part of the analysis completed by DFO and AENV during the development of the *Phase II Water Management Framework*. The Panel notes that DFO and AENV will monitor the proposed ecosystem base flow and will incorporate required adjustments to the Water Management Framework.

The Panel acknowledges that TOTAL has committed to

- adhere to the intentions of the *Phase II Water Management Framework* and all adaptive management, including no water withdrawals from the Athabasca River during low flow conditions;
- support the development of and participate in a monitoring program focusing on cumulative effects assessment of water withdrawals from the Athabasca River;

- support a water management framework that would be implemented with ongoing review and monitoring to improve the understanding of the effects of water withdrawals and incorporate these understandings into a system aimed at protecting the fish and fish habitat of the lower Athabasca River.

The Panel expects TOTAL to implement the above commitments if the project proceeds.

The Panel concludes that with implementation of the *Phase II Water Management Framework*, the subsequent adaptive management measures, and TOTAL's proposed mitigation measures and commitments, significant adverse cumulative environmental effects associated with water withdrawals from the Athabasca River during low flow periods are unlikely.

7.4 Water Quality

At the regional level, two main concerns about water quality were raised: the cumulative effects that oil sands projects may have on the water quality in the Athabasca River, and the acidification of water bodies in the oil sands region.

7.4.1 Views of TOTAL

TOTAL predicted that peak pre-industrial (1965) concentrations downstream from the confluence of the Ells River and the Athabasca River (Node AR1) would have exceeded guidelines for several constituents of potential concern. TOTAL stated that the higher levels generally occur because of elevated concentrations of total suspended solids upstream from Fort McMurray, principally during the spring season. TOTAL predicted that existing and approved developments would cause negligible change to constituent concentrations in the lower Athabasca River.

TOTAL predicted that in the application case, median concentrations of naphthenic acids and peak concentrations of polycyclic aromatic hydrocarbons and total dissolved solids at Node AR1would exceed baseline case concentrations in 2044 and into the far future because of end pit lake water release. TOTAL indicated that other parameters would not increase above baseline case concentrations, although they would exceed guideline values because of pre-industrial elevated levels. TOTAL predicted that all constituents of concern would be below chronic effects benchmarks.

TOTAL indicated that peak concentrations of naphthenic acids would increase in 2044 and decrease in the far future. While naphthenic acids do not have a chronic effects benchmark, TOTAL anticipated negligible effects on aquatic health due to naphthenic acids.

TOTAL stated that it predicted the levels of acute and chronic whole effluent toxicity and tainting potential for aquatic life to be below threshold values. TOTAL did not identify any constituents as a potential concern for bioaccumulation in fish tissue. TOTAL predicted insignificant cumulative changes in water quality and effects on aquatic health in the Athabasca River. These changes would result from the project in combination with other developments. TOTAL concluded that changes in sediment quality caused by the realignment of Joslyn Creek and the construction of the Athabasca River water intake would be negligible.

With regard to acidifying emissions, TOTAL noted that of the 34 water bodies included in its analysis, 11 were naturally acidified and have pH values below 6. Three lakes would potentially become acidified from deposition of sulphates and nitrates associated with developments considered under the baseline case. Under the application case and the planned development case, there would be no additional lakes acidified by deposition of sulphates and nitrates. TOTAL concluded that the predicted cumulative changes in the acidification potential of water bodies would be insignificant. When asked about the large predicted increase in the rates of acidification of the lakes, TOTAL indicated that it based its prediction on conservative modelling and that monitoring results did not show acidification.

TOTAL stated that the RAMP, a science-based and results-focused environmental monitoring program, evaluates and communicates the state of the aquatic environment and any changes that may result from cumulative resource development in the oil sands region. TOTAL indicated that it used 2004–2009 RAMP data in the assessment of environmental impacts of the project, and that no evidence suggested RAMP data were unreliable. TOTAL indicated that the RAMP results confirmed that measurement of concentrations of water quality constituents in the Athabasca River was consistent with regional baseline concentrations. TOTAL indicated that interveners raised concerns about the effectiveness of RAMP and that both the federal and provincial governments have assigned independent panels to review the water management regime in the region.

TOTAL, based on the cumulative assessment prediction, concluded that changes to water quality resulting from the project in combination with existing and planned developments would be insignificant.

7.4.2 Views of Interveners

Mikisew Cree First Nation and Athabasca Chipewyan First Nation (Untested Evidence)

MCFN stated concerns about Athabasca River water quality and the absence of detailed water monitoring plans. MCFN stated that Athabasca River water quality would be negatively affected by contaminated water seepage from end pit lakes and tailings ponds, air pollutant deposition, and surface water runoff from disturbed areas.

ACFN noted that many of its members already avoid drinking water and eating fish from the Athabasca River and Lake Athabasca. ACFN added that many of its members reported seeing negative changes in the Athabasca River over their lifetimes, such as changes in the taste and smell of the river water, the presence of unusual foams and films on the water, and the absence or decline of some species, including insects, along the river. Fear of contamination due to oil sands development on the Athabasca River and surrounding areas has caused many ACFN members to avoid traditional foods and resources, especially fish and drinking water.

Oil Sands Environmental Coalition and Sierra Club Prairie

OSEC and Sierra Club Prairie stated that recent scientific reports (Kelly et al. 2009—Oil sands development contributes polycyclic aromatic compounds to the Athabasca River and its tributaries, and Kelly et al. 2010—Oil sands development contributes elements toxic at low concentrations to the Athabasca River and its tributaries) contradicted TOTAL's and RAMP's statement that oil sands development in the lower Athabasca Region has had no detectable effect on water quality. OSEC and Sierra Club Prairie stated that RAMP's 2009 technical report used analytical techniques with lower detection limits to deal with some of the concerns, e.g., naphthenic acids. These groups noted that both the federal and provincial governments have established panels of independent scientists to investigate the water quality monitoring and science used in the lower Athabasca River, and that these governments would not be doing this if they were confident in the data that they were getting from RAMP.

OSEC and Sierra Club Prairie stated that TOTAL did not consider spatial patterns in deposition and accumulation of heavy metals, organic contaminants, and sediments in the aquatic ecosystems, and that it failed to identify existing and potential critical effects of oil sands development on fresh water in the lower Athabasca River. OSEC and Sierra Club Prairie stated that TOTAL used inappropriate guidelines to assess impacts on aquatic life of critical concentrations of pollutants (e.g., polycyclic aromatic hydrocarbons and heavy metals) in sediments. OSEC and Sierra Club Prairie disagreed with TOTAL's claim that there was little or no toxicity in sediments. OSEC and Sierra Club Prairie concluded that future oil sands development would cause polycyclic aromatic hydrocarbons and metals to accumulate and increase toxicity in aquatic sediments. OSEC and Sierra Club Prairie recommended that a characterization of spatial patterns and its relationship to oil sands development should be completed to provide comparison benchmarks for future sampling in the region.

OSEC and Sierra Club Prairie stated that according to TOTAL, at least half of the lakes monitored by RAMP are sensitive to acidification and that current potential acid input exceeded the critical load for 11 of the 34 lakes. Additionally, the predicted potential acid input for existing and approved oil sands operations would exceed the critical load in 17 of the 34 lakes. TOTAL predicted that under the planned development case, the potential acid input would increase by an average of 26 per cent above baseline conditions. OSEC and Sierra Club Prairie concluded that cumulative effects of acid emissions from oil sands operations would exceed the capacity of regional aquatic ecosystems to neutralize these acid emissions.

Government of Canada

EC stated that substances derived from oil sands development have the potential to impact the productivity of the Athabasca River delta and surrounding lakes in the long term. EC recommended that TOTAL extend its regional study area for aquatic resources to include the Athabasca River delta and the western end of Lake Athabasca.

EC stated that recent surveys of lakes in northwestern Saskatchewan have indicated that they are sensitive to acidification. EC recommended that TOTAL extend its regional study area for aquatic resources to include sensitive lakes in western Saskatchewan downwind of the oil sands.

Without the disclosure of model uncertainties or provision of confidence limits on model outputs, EC and NRCan expressed concern about the long-term accuracy of TOTAL's groundwater flow model, particularly the conclusion that seepage from the site into the Athabasca River was negligible.

EC stated that it is currently conducting research on the identification of bitumen and its constituents, the ultimate goal of which would be to help identify the sources of tailings pond residues in surface waters and contaminants in the river.

7.4.3 Panel Conclusions and Recommendations

The Panel recognizes EC's and NRCan's concerns about the accuracy of TOTAL's groundwater flow model, particularly the conclusion that seepage from the site into the Athabasca River would be negligible. The Panel expects AENV, as the legislated authority, to address this issue in the determination on TOTAL's *Environmental Protection and Enhancement Act* application.

The Panel acknowledges the existing exceedances of water quality guidelines for several water quality criteria, even though they appear to be a part of the pre-industrial environment in this region. The project, in combination with other oil sands operations, would likely add to some extent to these exceedances. The Panel notes that there are uncertainties about the effects of industrial development on water quality in the lower Athabasca River and that these should be resolved through better monitoring programs.

The Panel recognizes the research that EC is doing on the characterization of bitumen from different sources and commends EC for this work. This research might help determine whether any tailings ponds are contributing contaminants to the lower Athabasca River, and if so, which ponds. This attempt to trace the materials deposited to an individual source is important to mitigating any potential effects on the water quality of the Athabasca River.

The Panel acknowledges that both the federal and provincial governments have recently put in place independent advisory panels to better understand the water quality of the lower Athabasca River. The federal panel was to report back to the federal Minister of the Environment on the current state of environmental research and monitoring in the oil sands region and make recommendations to ensure that state-of-the-art monitoring and best practices are implemented. The focus of the provincial committee of experts was to examine the monitoring data and methodology of both government and academic research findings. These experts will also investigate whether data are consistent with historical values in the region and explain the relevance of any differences and gaps that may exist.

The Panel is of the view that the work of these two independent panels will help address the concerns and uncertainty about water quality in the oil sands region. While evidence provided by EC suggested that there may be some detectable cumulative effects downstream from mineable oil sands operations, the Panel finds, on the basis of the RAMP data, no reason to believe that these effects are significant.

7.5 Air Quality

This section focuses on greenhouse gas emissions. The project effects and cumulative effects on air quality are addressed in Section 6.5.

7.5.1 Views of TOTAL

TOTAL noted that the project would contribute 26.7 million tonnes of greenhouse gas emissions in CO_2 equivalent per year. This represents about 0.0038 per cent of global emissions, 0.17 per cent of Canada's greenhouse gas emissions, and 1.0 per cent of Alberta's greenhouse gas emissions. TOTAL stated that the environmental assessment showed that the project's greenhouse gas emissions were not significant in their effects on potential changes in climate or in their relative contribution to global greenhouse gas emissions. TOTAL's view was that the project compares favourably to other similar projects in terms of greenhouse gas intensity. TOTAL said that it did not propose providing for greenhouse gas capture and storage at the Joslyn mine project.

TOTAL stated that in order to manage greenhouse gas emissions it incorporated

- a cogeneration facility for generating steam and electricity;
- comprehensive vapour and solvent recovery to capture greenhouse gases, improve plant efficiency, and eliminate continuous operational flaring;
- research and development into carbon capture and storage technology and infrastructure, including assessing the feasibility of oxycombustion and postcombustion technology to capture CO_2 from the cogeneration facility;
- allocation of space for carbon capture equipment to facilitate its incorporation in the future when it is demonstrated to be viable; and
- an undertaking to further reduce greenhouse gases consistent with provincial and federal requirements and with TOTAL's corporate global reduction targets.

TOTAL pointed to the facility of its parent company TOTAL SA in France, the first end-to-end carbon capture, transportation, and storage demonstration project in Europe. TOTAL argued that between the years 2000 and 2009, TOTAL SA reduced its global greenhouse gas emissions by more than 4 per cent while continuing to grow its business. TOTAL's corporate climate change strategy includes corporate global targets to reduce direct greenhouse gas emissions by 15 per cent in 2015 from 2008 levels.

TOTAL did not agree with OSEC's view that the project would create an undue environmental impact on the global climate. TOTAL stated that the evidence presented clearly showed that the greenhouse gas emissions from the project would not have a significant adverse impact on climate change. Furthermore, climate change is a global issue caused by greenhouse gas emissions that can be emitted from anywhere in the world.

TOTAL stated that the joint review panel for the Mackenzie Gas Pipeline Project concluded that the evidence did not establish that the Mackenzie Gas Pipeline Project's greenhouse gas emissions would cause significant adverse environmental impacts; and yet, more greenhouse gas would be emitted by the Mackenzie Gas Pipeline Project than by the Joslyn North Mine Project. TOTAL was of the view that adverse environmental effects associated with greenhouse gas emissions from the project would be insignificant in a global context.

7.5.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC noted Dr. James Hansen's evidence that climate change is one of today's most urgent and challenging issues. This evidence stressed the importance of reducing greenhouse gas emissions since oil sands development produces greenhouse gas emissions that remain in the atmosphere for millennia, leaving a burden for future generations.

OSEC stated that if unconventional fossil fuel carbon is put into the atmosphere, the carbon would have to be removed from the atmosphere. OSEC noted that the cost of doing this, about $200 to $500 per tonne of carbon, should be added to the cost of extracting these unconventional fossil fuels; however, if this cost were added to the cost of an oil sands mining project, it would not be economically viable.

OSEC noted that there is no evidence that TOTAL would mitigate greenhouse gas emissions, other than through a hypothetical future carbon capture and storage facility. OSEC indicated that TOTAL's reference to its efficiencies at reducing global greenhouse gas emissions should not apply because TOTAL SA is not the proponent of the project.

OSEC recommended that TOTAL be required to

- meet a greenhouse gas emissions reduction target equivalent to the emissions of a conventional oil and gas operation,
- implement carbon capture and storage, and
- mitigate its greenhouse gas production by implementing carbon neutrality through onsite reductions and offsets.

Sierra Club Prairie

Sierra Club Prairie stated that although the amount of greenhouse gas emissions from any given project can be measured, it is difficult to determine the effects of a specific project at the global level. Sierra Club Prairie noted that it is not important how efficient a given operation is unless it is actually decreasing emissions. Sierra Club Prairie did acknowledge that the greenhouse gas mitigation measures proposed by TOTAL—the cogeneration plant and its commitment to make the facility ready for carbon capture and storage—are good initiatives. This group noted TOTAL's lack of commitment to capture and store carbon. Overall, Sierra Club Prairie concluded that the mitigation measures proposed by TOTAL to address greenhouse gas emissions are inadequate and that the aim should be to have a carbon-neutral project.

Government of Canada

EC noted that the Government of Canada established a national greenhouse gas emission target of 17 per cent below 2005 levels by 2020. The Government of Canada indicated that it intends to develop federal measures to address greenhouse gas emissions, including measures for the oil sands sector.

7.5.3 Panel Conclusions and Recommendations

The Panel notes TOTAL's argument that its contribution to greenhouse gas emissions would be very small compared with other sources. The Panel understands that TOTAL's project would add only 0.0038 of a per cent of greenhouse gas emissions to global emissions.

The Panel recognizes that in order to manage greenhouse gas emissions, TOTAL would incorporate a cogeneration facility for generating steam and electricity, a comprehensive vapour and solvent recovery to capture greenhouse gases, and would eliminate continuous operational flaring.

The Panel also notes from evidence filed by TOTAL that the oil sands' contribution to national greenhouse gas emissions has increased from 3 per cent in 2005 to 8 per cent in 2010 and is predicted to increase to 11 per cent by 2020. The Panel understands the difficulty in reducing greenhouse gas emissions and the fact that carbon capture and storage technology is still under commercial development.

The Panel encourages TOTAL to offset its greenhouse gas emissions by implementing reduction measures elsewhere. The Panel notes that TOTAL argued that it is required to manage greenhouse gas emissions on a corporate basis and that between 2000 and 2009, TOTAL SA reduced its global greenhouse gas emissions by more than 4 per cent. The Panel acknowledges that TOTAL SA has already reduced greenhouse gas emissions and has committed to further reducing its overall global emissions by 15 per cent from 2008 levels by 2015. The Panel is of the view that the impact of this corporate policy on the project is currently unknown and thus its implementation cannot be considered a mitigation measure when assessing the significance of the project's effects on air quality. However, the Panel recognizes that the global policy adopted by TOTAL SA respecting greenhouse gas emissions could result in further emission reductions from the project

Finally, TOTAL stated that it would further reduce greenhouse gas emissions as required in any future provincial or federal legislation. To this end, the Panel also notes the need for TOTAL to incorporate sufficient flexibility in the design of the project to facilitate retrofitting of the new controls needed to fully comply with reasonably foreseeable changes to current emission standards and new environmental management frameworks.

For the reasons expressed above, the Panel is of the view that the project is not likely to result in significant adverse environmental effects to air quality caused by greenhouse gas emissions, provided that the mitigation measures proposed are completed and implemented.

7.6 Current Use of Lands and Resources for Traditional Purposes by Aboriginal Persons

7.6.1 Views of TOTAL

TOTAL assessed the cumulative effects on traditional land use by assessing the cumulative effects on various environmental components, such as wildlife. TOTAL concluded that the project could proceed without significant effects on these components at the regional level. TOTAL recognized that similar conclusions cannot, by extension, be applied to effects on individual traditional land users.

TOTAL indicated that it provided funding to ACFN and offered funding to MCFN to conduct traditional ecological knowledge and traditional land use studies which are still ongoing. In the absence of these completed studies, TOTAL noted that it was not in a position to definitively comment on the level of effects on traditional land use for ACFN and MCFN

In its final argument, TOTAL stated that the evidence submitted by MCFN, ACFN, and Fort McKay was not presented during the hearing and, therefore, was not tested. It also stated that all the tested evidence in the proceedings showed either that lands used for traditional pursuits would not be significantly affected by the project or that effects would be appropriately mitigated. TOTAL stated that it considered community knowledge and traditional knowledge in the environmental assessment and that the results support the conclusion that effects on traditional land use in the regional study area would be limited.

7.6.2 Views of Interveners[42]

Mikisew Cree First Nation (Untested Evidence)

In its submission, MCFN argued that the cumulative effects of developments in and around its traditional land have rendered the rights promised to them in Treaty 8 meaningless. It noted that there has been a conversion of the land from a landscape with a balance of wilderness and habitat suitable for traditional harvesting practices to a landscape dominated by industrial features associated with oil sands development, oil sands exploration, oil and gas development, forestry, road networks, and urban and suburban development. MCFN noted that the lands along the Athabasca River south of Wood Buffalo National Park have been heavily developed, and that opportunities to hunt, harvest, or use the land for other traditional purposes are severely limited and are, for the most part, not available for use in a traditional manner. MCFN also noted that other aspects of their traditional way of life have been compromised by the alteration in the water regime caused by the Bennett Dam and by the extraction of water for oil sands and other purposes, limiting the ability of MCFN to continue to enjoy the traditional fish harvest and economic opportunities of fishery.

Fort McKay First Nation and Métis Local #63 (Untested Evidence)

Fort McKay noted that, based on a map it filed showing the trapping areas of Fort McKay, 78 per cent of these trapping areas have been leased for oil sands development. In the next 20 years, based on current planned developments, 60 per cent of the remaining trapping areas would be gone. Fort McKay noted that these trapping areas have become very important to the community because traditional land use is concentrated in these areas.

Fort McKay noted that the level of existing, planned, and anticipated development raises very significant concerns about the long-term environmental, social, health, and fiscal sustainability of the community. Even if the effects of each project are properly mitigated, significant cumulative adverse effects may still result. According to Fort McKay, this level of development results in a lot of secondary effects such as an increase in people in the region, the use of First Nations trapping areas by outsiders for recreation, and increases traffic. Fort McKay submitted that despite the improvement in projects and environmental management, oil sands development continues and the impact on Fort McKay's aboriginal and treaty rights and community has increased, largely unmitigated. Fort McKay stated that there have been significant adverse effects on Fort McKay's cultural heritage and on traditional land use as a result of existing oil sands and related development. Fort McKay was of the view that these effects would increase as a result of the planned development.

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[42] The panel notes that MCFN, Fort McKay, and ACFN withdrew their opposition to the project and did not present direct evidence during the hearing. These aboriginal groups presented their concerns about cumulative effects during closing arguments. Therefore, other parties, TOTAL, and the panel did not have an opportunity to cross-examine these groups on the arguments presented.

Fort McKay noted that the Cultural Heritage Assessment Baseline Study it completed in March 2010 found that the current level of development has already had significant adverse effects on hunting, trapping, fishing, and gathering areas. Among other things, this study noted that 46 per cent of traditional berry sites have been lost since 2007. Fort McKay submitted that this was a permanent loss because these sites cannot be replaced through reclamation. The study also noted that a lot of moose habitat has been directly disturbed and that population levels have declined. Twenty per cent of the high- and moderate-quality moose habitat in Fort McKay's intense-use culturally significant ecosystem for moose harvesting has been lost. Fort McKay also indicated that recent surveys conducted by SRD documented a 60 per cent reduction in moose population density from 1994 to 2009 in wildlife management unit 531.

Athabasca Chipewyan First Nation (Untested Evidence)

ACFN noted that it was concerned with the government's response to cumulative effects of oil sands development on its traditional lands and on its rights under Section 35 of the Constitution Act. ACFN added that MCFN's submissions on the state of its traditional lands and the circumstances in which it finds itself apply equally to ACFN.

ACFN argued that its traditional lands have rapidly changed in recent decades. This change has significantly reduced its members' ability to exercise treaty rights on the lands near where a vast majority of them reside. ACFN requested that if the project proceeds, the Panel should recommend that the governments of Canada and Alberta consult with ACFN before issuing further decisions on oil sands projects.

Mike Guertin

Mr. Guertin stated his concerns about the oil sands developments and their impacts on his way of life. He said that he lives along the Athabasca River, eats country food, and drinks water from the river when circumstances dictate. He stated his concern about the potential contamination of the food that his family eats and the water that they drink. He also indicated that some species are declining. Mr. Guertin owns a company that offers guiding and outfitting for big game and wilderness tours. Mr. Guertin raised concerns about access to his trapline, noting that CNRL had denied him access to the old traditional McKay Road that give him access to his trapline. He is of the view that people should be allowed to access their traplines.

7.6.3 Panel Conclusions and Recommendations

The Panel acknowledges the concerns expressed by aboriginal groups and aboriginal people who live in and occupy the territory affected by oil sands developments.

The Panel notes that Fort McKay, MCFN, and ACFN have all reached agreement with TOTAL and do not object to the project going ahead. However, the Panel is aware that these groups all stated concerns about the cumulative effects of oil sands developments in general. While the Panel suspects, based on the untested evidence submitted, that these effects may be serious, they were not presented in a manner that allows the Panel to have sufficient confidence to draw any substantial conclusions.

8 SUSTAINABILITY OF RENEWABLE RESOURCES

Section 16(2)(d) of the *Canadian Environmental Assessment Act* requires that a review panel's assessment consider the capacity of renewable resources that are likely to be significantly affected by the project to meet present and future needs.

8.1 Views of TOTAL

During the hearing, TOTAL noted that it was confident in the capacity of resources likely to be affected by the project to continue to meet both present and future needs.

8.2 Views of Interveners

Several interveners raised concerns about wildlife (Sections 6.1.2 and 7.2.2).

8.3 Panel Conclusions and Recommendations

For the sustainability of renewable resources, the Panel is mainly concerned with wildlife species that are important resources for aboriginal people. In particular, the Panel heard concerns about the reduction in moose, woodland caribou, and wood bison populations. Both woodland caribou and wood bison are wildlife species listed under the *Species at Risk Act*.

The Panel concludes that since the project is not expected to directly affect woodland caribou and wood bison, there would not be any further cumulative effects on those two species from the project. For moose and other wildlife, the Panel believes that the recommendations it makes in Section 6.1.3 and in Section 7.2.3 would ensure that populations of moose and other wildlife that are important resources for aboriginal people and others meet present and future needs. Again, the Panel stresses that it is important that the Government of Alberta identify protected areas in the RMWB that can serve as a refuge for wildlife populations affected by oil sands development.

9 SOCIOECONOMIC EFFECTS

9.1 Economic Benefits

9.1.1 Views of TOTAL

TOTAL stated that the project would bring substantial benefits to Alberta and Canada. It anticipated that project's capital costs would fall between $7 and $9 billion. TOTAL estimated that 5 per cent of project construction expenditures would likely accrue to the RMWB residents and companies. It estimated that another 44 per cent would accrue to the rest of Alberta and 20 per cent would accrue to the rest of Canada.

TOTAL projected that the project would create 16 560 person-years of direct construction employment and another 1300 operations jobs. It stated that the construction workforce would peak at 4100 between the first and second quarter of 2015.

TOTAL projected annual operating expenditures, excluding energy purchases, of $580 to $615 million.

TOTAL estimated that the project would pay $10.5 billion over the life of the project to the federal and provincial governments. It estimated annual property tax payments to RMWB of $52 million.

9.1.2 Views of Interveners

Regional Municipality of Wood Buffalo

The RWMB recognized the economic benefits of oil sands development for the RMWB, Alberta, and Canada. It noted, however, that the RWMB's only direct share of oil sands development is through property taxes, which represent a small portion of taxes and royalties collected provincially and federally. The RMWB noted that this was in disproportion to the costs born as a result of increased demand on infrastructure and public services, which are incurred almost entirely by the RMWB. The RMWB further identified the timing gap between infrastructure funding and the collection of property tax revenue as a major concern.

The RMWB requested that Alberta and Canada recognize the significant financial benefits of oil sands development and put in place policies and programs to ensure that more benefits accrue locally.

9.1.3 Panel Conclusions and Recommendations

The Panel acknowledges the economic benefits associated with the development and operation of the project. It also notes that while the need for governments to invest in new infrastructure and expanded public services will offset some of the taxes and royalties generated by the project, the net benefits derived from the project would be significant for the RMWB, Alberta, and Canada.

9.2 Public Infrastructure and Municipal Services

9.2.1 Views of TOTAL

TOTAL recognized that the population increases associated with the project due to total direct, indirect, and induced labour demand would impact public infrastructure and municipal services. It noted that conditions in 2010 are significantly different than those that existed in 2006 when infrastructure and municipal services were under great pressure. TOTAL stated that while pressures on infrastructure and services still exist, they are significantly lower than 2006 levels.

To reduce the project's potential demand on public infrastructure and services, TOTAL proposed a "fly-in-fly-out" approach in which 90 per cent of the construction and operations workforce would live outside the region and but housed in a camp during their shift rotation. TOTAL stated that it would anticipate and encourage more workers to come from local sources over time in a way that would not stress local infrastructure.

9.2.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC stated that additional financial support provided by the Government of Alberta for public services and infrastructure in Fort McMurray has not been sufficient to address the accumulated infrastructure deficit from the last wave of intensive growth. OSEC noted that the deficit included public service systems such as schools and medical services, in addition to roads deemed insufficient to meet current demand.

OSEC submitted that based on the stress on the regional infrastructure and the hardships of residents of Fort McMurray any cumulative increase in the infrastructure deficit was not in the public interest.

Regional Municipality of Wood Buffalo

The RMWB entered into a memorandum of understanding with TOTAL to address and mitigate its socioeconomic concerns associated with the safety of the water supply, the timeliness of municipal revenues, the impact of "fly-in-fly-out" operations, and impacts on public health and safety. The RMWB noted that while it supported the project, it still had concerns with camp-based operations. The RMWB noted that while camp-based operations may alleviate some pressures in the short-term, they have negative impacts on the local community in the long-term such as a weakened sense of community and a loss of a secondary labour and volunteer pool that families could provide. As a result, the RMWB stated that it would prefer oil sands workers and their families to live in the local communities.

The RMWB noted its appreciation for the steps the Government of Alberta has taken to work with the RMWB to address the socioeconomic challenges facing the RMWB. Among the items noted by the RMWB were the approximately $306 million allocated to water management, recreational facilities, housing, and policing needs and the approximately $700 million allocated to roads and interchanges. The RMWB also noted that work to address the issues is ongoing and that additional support from the Government of Alberta is required. In addition, the RMWB requested more support and involvement from the Government of Canada.

Fort McMurray Chamber of Commerce (Untested Evidence)

The Fort McMurray Chamber of Commerce, in a written submission, acknowledged that the growth in the oil sands had generated significant socioeconomic impacts to the region. However, it noted that was confident that with cooperation among the various levels of government, the Chamber of Commerce, industry and local citizens the pace of development could be managed, both responsibly and for the benefit of all Albertans. By way of example, the Fort McMurray Chamber of Commerce noted the Government of Alberta's $2.25 billion in investment in the local region that has or will occur to address many of the pressures on infrastructure that the high rate of population growth has required. The Fort McMurray Chamber of Commerce noted that this $2.25 billion included funding for a new bridge across the Athabasca River, two new overpasses, twinning Highway 63 north between Fort McMurray and the Fort McKay turnoff, twinning Highway 63 south to Highway 881 with plan for future twinning to Highway 55, and increased capacity in water and waste water treatment.

9.2.3 Panel Conclusions and Recommendations

The Panel is encouraged by TOTAL's and RMWB's agreement to manage the project's impacts on infrastructure and municipal services.

The Panel is encouraged by the progress made by the Government of Alberta and the RMWB in addressing the issues that existed in 2006. The Panel acknowledges that that there has been substantive improvement in public infrastructure and municipal services since 2006. The Panel notes that RMWB indicated it has received limited support from the Government of Canada and encouraged the Government of Canada to invest more in the region in proportion to the significant fiscal and economic benefits it derives.

The Panel recognizes the concerns raised by the RMWB with respect to TOTAL's "fly-in-fly-out" approach to operations. However, the Panel believes that at this time this approach represents the best alternative given the evidence submitted. The Panel believes that during the operational life of the project, regional circumstances may change and that this approach could evolve into a more local workforce.

9.3 Availability of Housing and Affordable Housing

Accounting for the total direct, indirect, and induced labour effect of the project, TOTAL estimated the regional housing need associated with the "fly-in-fly-out" approach to be 345 to 410 units by 2018. It stated that this is equal to about 25 per cent of new housing construction in Fort McMurray in 2008, and that the "fly-in-fly-out" approach with the project camp would reduce the need for RMWB urban housing by 1900 to 2250 units.

9.3.1 Views of Interveners

Regional Municipality of Wood Buffalo

The RMWB stated that housing prices in the municipality remain the highest in the province, with an average price of $683 748 for a single-family dwelling in Fort McMurray as of June 2010. Rental rates also remain the highest in the province, it said, with an average monthly rent of $1706 for a one-bedroom unit, in contrast to $838 in Edmonton and $891 in Calgary. It said the high cost of housing had carry-through effects for local businesses by putting upward pressure on wages. The RMWB identified homelessness as an increasing concern, noting that many of the homeless population were employed.

The RMWB said the housing gap that existed in 2006 continues and would widen if key barriers to increasing the housing supply are not addressed. The RMWB stated that current initiatives to increase the housing supply, such as the Parsons Creek development, are still in the development stage and that it will be some time before their effects are felt.

The RMWB stated that the Government of Alberta's land release and $241 million in funding to support the Parsons Creek and Saline Creek Plateau developments are only part of the solution. It identified local construction capacity and the provision of services as additional constraints. It further noted that even if all of development challenges were overcome, the land released and planned to be released by the Government of Alberta would not be sufficient to meet future demand.

Fort McMurray Chamber of Commerce (Untested Evidence)

The Fort McMurray Chamber of Commerce acknowledged that housing and rental rates in the region are very high. However, the Chamber believes that land released and planned to be released by the Province of Alberta will significantly improve the situation.

Non-Status Fort McMurray Band Descendants

The Non-Status Fort McMurray Band Descendants noted that housing affordability and homelessness remain key issues for members of the band.

Oil Sands Environmental Coalition

OSEC noted that housing is still a critical issue for the region and that housing costs continued to be well above provincial averages. OSEC stated that high housing costs cause hardship for people who work in the retail sector or for not-for-profit agencies.

9.3.2 Panel Conclusions and Recommendations

The Panel is encouraged by the progress made by the Government of Alberta in cooperation with the RMWB to address the availability of housing, including affordable housing. However, the Panel is aware that new project development or the expansion of existing projects and the associated increase in demand for housing could cause a return to conditions as existed in 2006 with an overheated rental market and less affordable housing.

The Panel recommends that the Government of Alberta continue to work with the RMWB to ensure that the supply of land for residential development and the necessary planning are in place to meet the existing and expected housing demand in the region.

9.4 Health Services

9.4.1 Views of TOTAL

TOTAL stated that it has signed a memorandum of understanding with the Northern Lights Regional Health Authority, now the Alberta Health Services Northeast Region, outlining its commitment to establish an onsite medical centre for the project. It said that the medical centre would be equipped to stabilize serious injuries, provide remote online consultations with physicians, dispense common prescription medicines, and provide first aid. TOTAL noted that access to the services for residents of Fort McKay is under review.

9.4.2 Views of Interveners

Oil Sands Environmental Coalition

OSEC said that the project would further stress an already stressed health care system. It said that the Alberta Health Services Northeast Region is struggling to provide basic health care to the RMWB's expanding population and that its shadow population of workers. OSEC stated that despite the mitigation proposed by TOTAL, more strain on regional health services is to be expected should the project go ahead.

Regional Municipality of Wood Buffalo

The RMWB noted that funding for community health and wellness centres, three new clinics, and the land for a long-term care facility address a shortage of hospital beds and health centres that was identified in 2006. The RMWB stated that as in 2006, the region is still suffering from a shortage of doctors, and that there are currently eight vacancies posted on the Alberta Physician Link Web site for the Fort McMurray area, five of which are for general practitioners.

9.4.3 Panel Conclusions and Recommendations

As a result of TOTAL's commitment to establish an on-site medical centre and in light of the progress made by the Government of Alberta in addressing issues in the region, the Panel finds that the effects of the project have been appropriately mitigated.

9.5 Human Health

9.5.1 Views of TOTAL

TOTAL undertook a human health risk assessment to identify direct and indirect health risks from air emissions in the regional study area and water quality changes in the local study area from mine development. TOTAL characterized health risks from air emissions by comparing modelled short- and long-term concentrations of chemicals of potential concern with regulatory guidelines to protect sensitive individuals.

TOTAL assessed the health risks of eating fish and other country foods by predicting long-term exposures to persistent and/or accumulative chemicals. Estimated long-term exposures were compared with chemicals of potential concern exposure limits that are considered protective of sensitive individuals.

TOTAL assessed the following receptor locations:

- Fort McKay,
- Patricia McInnes Station, Fort McMurray,
- Athabasca Valley, Fort McMurray,
- trapper cabin,
- project camp,
- Fort Chipewyan, and
- the fenceline maximum point of impingement[43] for air quality.

For aboriginal communities such as Fort McKay and Fort Chipewyan, TOTAL assumed that the average resident obtained 100 per cent of food and nutrition from country food sources. In residential communities such as Fort McMurray, TOTAL assumed that the average resident obtained 90 percent of food and nutrition from the supermarket and 10 per cent from country food sources.

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[43] Fenceline maximum point of impingement for air quality is the location at the fenceline of the project where the maximum short-term air concentrations associated with the project are predicted to occur.

TOTAL's human health risk assessment focused on emissions from the operations phase of the project because emissions are predicted to be higher during this phase than during construction.

Acute Inhalation Health Risks

TOTAL's assessment of acute inhalation health risks concluded that the predicted concentrations of individual chemicals of potential concern, and chemical mixtures, would be below health-based exposure limits.

TOTAL predicted that fine particulate matter with a diameter smaller than 2.5 µm (fine particulate matter) concentrations in excess of Canadian Council of Ministers of the Environment guidelines would occur at Fort McMurray in the project development case and at the fenceline maximum point of impingement in the baseline and application cases.

TOTAL's air quality assessment determined that the primary contributor to fine particulate matter concentrations at the fenceline maximum point of impingement was emissions from mine operations and vehicle fleets associated with mines in the regional study area. The primary contributors of fine particulate matter concentrations at Fort McMurray were emissions from the community itself, such as households, commercial buildings, and vehicles. TOTAL concluded that the predicted increase in occurrences of fine particulate matter exceedances at the Fort McMurray or fenceline maximum point of impingement receptor locations are from sources other than the project and that the project itself would not appreciably increase the occurrences of fine particulate matter exceedances at these locations.

Chronic Inhalation Health Risks

TOTAL predicted chronic inhalation risks for aboriginal, residential community, and project camp receptors for all chemicals of potential concern that have chronic exposure limits. TOTAL separated assessments for carcinogens and non-carcinogens because it needed different approaches to calculate and interpret risk estimates for each group of chemicals.

Noncarcinogenic chemicals:

- TOTAL's assessment predicted that the long-term air concentrations of noncarcinogenic chemicals of potential concern would remain below health-based exposure limits at all receptor locations.

Carcinogenic chemicals:

- TOTAL's assessment of health risks from carcinogenic chemicals of potential concern focused on incremental lifetime cancer risks and stated that a value of less than 1 in 100 000 indicates that the incremental lifetime cancer risks from the project and future sources are negligible.

- TOTAL concluded that incremental lifetime cancer risks from carcinogenic chemicals of potential concern associated with the project were predicted to be less than 1 in 100 000, and that the incremental cancer risks from the project and future sources would be negligible.

Multiple Pathway Health Risks

TOTAL's assessment of multiple pathway health risks examined noncarcinogens, carcinogens, and chemical mixtures separately.

Noncarcinogenic chemicals:

- For aboriginal receptors, TOTAL predicted that concentrations of antimony, methyl mercury, and associated mixtures in all three assessment cases exceed chronic exposure limits. It predicted molybdenum concentrations to exceed chronic exposure limits in the far-future assessment.

- TOTAL predicted concentrations of antimony, methyl mercury, manganese, and associated mixtures in excess of chronic exposure limits for residential community receptors in all three assessment cases.

- TOTAL stated that methyl mercury was identified as a chemical of potential concern but would not be emitted by the project.

- TOTAL concluded that because of the assessment's highly conservative determination of media concentrations and exposure limits and its highly conservative assumptions about country food consumption patterns, health risks associated with the above predicted exceedances would be negligible.

Carcinogenic chemicals:

- TOTAL predicted that project and future incremental lifetime cancer risk values for all receptors would be below the acceptable value of 1 in 100 000.

- TOTAL predicted the far-future pit lake incremental lifetime cancer risk value to be 1.5 in 100 000 for benzo(a)pyrene equivalent. However, TOTAL concluded that based on the conservative water quality modelling used for the assessment predictions and the time available to optimize pit lake water quality, the predicted health risks were overstated.

Chemical Mixtures

TOTAL stated that chemical mixtures consist of chemicals that act on similar end points. If the predicted concentration of a single chemical in the mixture exceeds chronic exposure limits, the entire mixture is considered to exceed the exposure limit. Predicted health risks were expressed as risk quotients. A risk quotient value of less than 1 indicated no predicted increased risk to human health.

- TOTAL predicted neurotoxicant mixture risk quotients of 6.5 for aboriginal receptors and 4.5 for residential community receptors. TOTAL stated that health risks associated with neurotoxicant mixtures are primarily due to manganese and methyl mercury. TOTAL stated that the project would not emit methyl mercury and that the estimated intake levels of manganese appeared to fall within the range of typical exposure levels. TOTAL concluded that the project would unlikely have adverse neurotoxic effects.

- TOTAL stated that risk estimates for hepatotoxicant mixtures and renal toxicant mixtures are based primarily on antimony. TOTAL stated that the estimated risk quotient for antimony is based on a highly conservative game meat concentration and that it did not expect the project to contribute to predicted antimony exposure. TOTAL concluded that because health effects from antimony are not expected, hepatotoxicant mixtures or renal toxicant mixtures are not expected to have health effects.
- TOTAL stated that the risk quotient for reproductive and developmental toxicants is associated primarily with methyl mercury. It stated that it does not expect the project to affect methyl mercury concentrations. TOTAL did not predict any adverse health effects from reproductive and developmental toxicant mixtures.

During the hearing, TOTAL was asked by the Panel whether Alberta Health and Wellness and/or HC had made any effort to investigate reports of elevated cancer rates and occurrences of rare cancers in Fort Chipewyan. TOTAL stated that in February 2009, the Alberta Cancer Board had released the report *Cancer Incidence in Fort Chipewyan, Alberta, 1995–2006*, and provided a copy of the report for the record. TOTAL indicated that since the release of the report, the Alberta Cancer Board, Alberta Health and Wellness, HC, and Fort Chipewyan have been in discussions and that a community health assessment is planned or underway in the community. TOTAL stated that it plans to participate in the Alberta Health Services (i.e., Northern Lights Regional Health Authority) initiatives to monitor human health in the oil sands region.

Overall, TOTAL's human health risk assessment concluded that the project would not result in significant risks to human health.

9.5.2 Views of Interveners

Mikisew Cree First Nation (Untested Evidence)

MCFN reported that its members have observed depletion and deterioration of fish, animals, and plants that they rely on for their health, sustenance, and economy.

MCFN noted its members' fear of eating fish from the Athabasca River because of concerns about fish deformities and poor fish health, which the Mikisew attribute to the oil sands industry.

Fort McKay First Nation and Métis Nation Local #63 (Untested Evidence)

Fort McKay stated that the rapid industrialization of the region and associated changes in the social and physical environment are causing stress and stress-related illness. It stated that reduced opportunities for traditional pursuits may lower community health because of reduced

- physical activity,
- access to healthy (i.e., country) foods,
- family cohesion, and

- transmission of language and culture.

Fort McKay also raised concerns about noxious odours from oil sands developments.

Athabasca Chipewyan First Nation (Untested Evidence)

ACFN noted that its members avoid drinking water or eating fish from the Athabasca River because of health concerns stemming from observed changes in the taste and smell of the river water.

ACFN raised concerns about the potential health effects of eating potentially contaminated country foods. Its members have observed a decline in the quality and quantity of country foods, including accounts of tumours and abnormalities in fish and moose. Fish have been caught and thrown back because of deformities, loss of colour, and excessive slime.

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

The Non-Status Fort McMurray Band Descendants and the Clearwater River Band No. 175 stated that they have observed a reduction in the quality and quantity of country foods in the Fort McMurray area, and they have concerns about the potential health effects of eating country foods contaminated by industrial activities.

They also raised concerns about the cumulative effects of oil sands development on aboriginal health, including the cumulative effects on drinking water quality. They asked about the possibility that "fly-in-fly-out" workers would contribute to health concerns by introducing bedbugs or communicable disease to the Fort McMurray area.

Nancy Scannie

Mrs. Scannie stated that she is no longer able to gather berries or traditional medicines from the Fort McKay area because of industrial development and that she often has to throw away rabbit, duck, and moose meat because the animals appear sick or the meat appears to be infected. She also stated that fish often have to be thrown away because of rapid spoilage.

Mrs. Scannie stated that aboriginal people rely on country foods and traditional medicines and that not having them available contributes to poor health.

Mike Guertin

Mr. Guertin stated that he has used bottled water instead of the Athabasca River as his drinking water source for about nine years because of concerns about heavy metals and other contaminants; however, when circumstances dictate, he uses the river as a source of drinking water.

Mr. Guertin also stated that he has observed a decline in the quality and quantity of country foods in the region and that he is concerned about the potential health effects of consuming country foods harvested from the oil sands region.

Government of Canada

HC stated that it reviewed TOTAL's human health risk assessment to confirm that potential health impacts of changes to the environment caused by the project were adequately assessed. Its review focused on the potential contamination of county foods and on the effects of changes in air quality and drinking water quality.

HC noted that it does not have the expertise to confirm the adequacy of the results of the environmental modelling conducted by TOTAL; therefore, HC's conclusions depend on the validity of TOTAL's predicted environmental concentrations.

HC concurred with TOTAL's conclusions about the potential health effects of changes in air quality, drinking water, and country foods caused by the project, but it made several recommendations about ongoing monitoring and follow-up:

- HC noted that particulate matter (specifically fine particulate matter) concentrations are predicted to exceed the Canada-wide standard for acute inhalation health risks in the planned development case for the Fort McMurray residential receptor and at the fenceline maximum point of impingement in the baseline and application cases. HC recommended that TOTAL develop mitigation plans to address the increased health risks posed by inhalation of fine particulate matter and by multi-pathway exposure to other substances. HC recommended that TOTAL uphold the Canada-wide standard principle of "keeping clean areas clean."

- HC recommended that TOTAL present additional assessment scenarios representing the background (i.e., no sector sources) and the project alone, excluding facilities not yet in operation (i.e., approved or planned future developments). In HC's opinion, the addition of these scenarios would provide a clearer picture of the impacts of the project on existing conditions.

- HC supported continued monitoring of mercury concentrations in fish tissue to confirm modelling predictions and ensure that concentrations remain at the background level.

- HC supported ongoing monitoring of molybdenum concentrations in fish to confirm modelling predictions and ensure that molybdenum concentrations in fish do not pose a significant risk to human health in the future.

- HC stated that it was aware of, and supported, the Alberta Cancer Board's report *Cancer Incidence in Fort Chipewyan, Alberta, 1995–2006*, dated February 2009. HC stated that a physicians working group had been established to provide recommendations for a community health study to address the health concerns of the community of Fort Chipewyan. HC explained that it is a member of the working group but that the appropriate jurisdictional lead is the Nunee Health Board Society, which is the health authority for the community of Fort Chipewyan based on a transfer agreement between ACFN, MCFN, and HC. The Nunee Health Board is funded to manage and administer primary care and public health care services to all residents of the community.

9.5.3 Panel Conclusions and Recommendations

The Panel notes the concerns raised by interveners regarding perceived declines in drinking water quality and air quality and observed declines in quality and quantity of country foods in the oil sands region. However, based on the information available, the Panel is unable to conclude that these observations can be linked to effects on human health.

The Panel supports ongoing monitoring, assessment, and management of health effects in the oil sands region and expects TOTAL to honour its commitment to participate in regional health initiatives. The Panel also supports the undertaking of a community health study in Fort Chipewyan to address the recommendations in the Alberta Cancer Board's 2009 report on cancer incidence in Fort Chipewyan. It appears to the Panel that health officials at the local, provincial, and federal levels are aware of the health concerns of people in the region and are in the best position to determine appropriate action.

Based on the human health risk assessment submitted by TOTAL and the review of the assessment conducted by HC, the Panel determines that environmental effects of the project are unlikely to cause significant adverse effects on human health.

9.6 Noise

The ERCB has jurisdiction over noise emitted from all the operations and facilities that it regulates. The requirements for noise control are outlined in *Directive 038—Noise Control*. The directive considers noise at the point of the receptor and aims to have noise levels not adversely affect indoor noise levels for residents near facilities. It addresses environmental noise, not health-related impacts.

9.6.1 Views of TOTAL

TOTAL indicated that it predicted the exceedance of the nighttime allowable sound limit at James Grandejambe's cabin, currently located on the Joslyn Lease. TOTAL has committed to a noise monitoring program to verify its compliance with *Directive 038*. The program would include the project's construction and operation phases and would verify the sound predictions at the cabin and at other locations.

To mitigate the predicted exceedance and other potential noise-related impacts from the construction and operation of the project, TOTAL has made commitments directly to James Grandejambe and to the community of Fort McKay.

9.6.2 Views of Interveners

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

The groups expressed general noise-related concern about the bird deterrent system proposed for use at the tailings pond.

Government of Canada

HC submitted a number of noise-related concerns about the project, including concerns about low-frequency noise, sound level exceedances at James Grandejambe's cabin, and construction noise. Additional information provided by TOTAL alleviated many of HC's concerns.

HC stated that it remains concerned about noise during the construction stage of the project. It said that a firm commitment by TOTAL to resolve any construction noise-related problems may be an acceptable mitigation solution.

HC supports TOTAL'S commitments to resolve the issues regarding James Grandejambe's cabin.

EC expressed concern about the effects of noise on migratory birds listed under the *Species at Risk Act* in the Ells River valley. EC recommended setback distances from the nests of these species. Further information on the effects of noise on migratory birds listed under the *Species at Risk Act* in the Ells River valley can be found in Section 6.1 of this report.

9.6.3 Panel Conclusions and Recommendations

The Panel finds that TOTAL has adequately addressed the noise-related concerns of Fort McKay and HC. The Panel acknowledges, and expects TOTAL to keep the various commitments that it has made to mitigate the noise impacts of project construction and operation.

The Panel requires TOTAL to monitor noise levels at James Grandejambe's cabin. Should noise levels exceed those outlined in *Directive 038*, TOTAL shall ensure that mitigation measures are implemented and that *Directive 038* compliance is met.

9.7 Access Management

All infrastructure within the project footprint would be affected by project development. Existing access (Figure 5), includes roads currently owned by CNRL, the RMWB, and TOTAL, and the Moose Lake Trail. An ATCO high-voltage transmission line is aligned along the north boundary of the Joslyn lease and would require relocation during project development.

The Moose Lake Trail is an important historical trail that runs along the north side of the Ells River and across Joslyn Creek, connecting Fort McKay and Moose (Gardiner) Lake. This trail is used for travel, hunting, fishing, trapping, and other harvesting purposes. The Moose Lake Trail is a key access route for the Fort McKay First Nation to Moose Lake and areas west of Fort McKay for traditional land use activities.

An access management plan has been proposed to mitigate public concerns about access around the project to the west.

9.7.1 Views of TOTAL

TOTAL advised that the existing CNRL mine road would provide access to the project. TOTAL acknowledged that traditional pursuits within the footprint of the proposed mine development would be affected during the life of the project. TOTAL noted that it would work with the Fort

McKay Industry Relations Corporation to ensure that trappers have access to the Moose Lake Trail and to their traplines located on nonactive parts of TOTAL's Joslyn lease holdings.

TOTAL advised that it committed to providing Aboriginals and other stakeholders with access to the Moose Lake Trail once project development commenced. In its original application, TOTAL noted that it would re-establish the access to the Moose Lake Trail by routing this access through the project. TOTAL indicated that a potential alternative access could be located along the CNRL and TOTAL lease boundary; such an alternative access would need to be coordinated with CNRL development. TOTAL offered to include the Fort McKay and Non-Status Fort McMurray bands in the working group that would develop access management alternatives for the area.

TOTAL stated that mine closure would occur in about the year 2044 and that public access to the development area would be permitted 15 or 20 years after that time, when the reclamation has been certified by the Government of Alberta.

9.7.2 Views of Interveners

BP Canada Energy Co. (Untested Evidence)

BP Canada stated that it was developing the Terre de Grace in situ oil sands project immediately adjacent to the western boundary of the Joslyn North Mine Project. BP Canada was concerned that the project would affect potential routing of roads, pipelines, and power needed for development of the Terre de Grace in situ oil sands project.

BP Canada stated that an agreement had been struck with TOTAL to resolve its issues using cooperative management strategies.

Canadian Natural Resources Limited (Untested Evidence)

CNRL stated that its Horizon mine was directly north of the proposed project, so it would be in the best interests of both companies to work together on common issues. CNRL questioned TOTAL's approach to the use of CNRL's road and observed that a road use agreement would be required.

Fort McKay First Nation and Métis Nation Local #63 (Untested Evidence)

Fort McKay noted in written submissions that it had traditionally used the Moose Lake Trail for access to Moose Lake and areas west of Fort McKay. Fort McKay observed that the project would eliminate a portion of the Moose Lake Trail. Fort McKay advised that the loss of the Moose Lake Trail would limit its ability to access the land and its ability to conduct traditional use. Fort McKay noted that it had participated with SRD, CNRL, and TOTAL in developing the Moose Lake access management plan, but that the initiative was on hold. Fort McKay observed that the access management plan was crucial for the community and wished to be involved in its development and implementation as soon as possible.

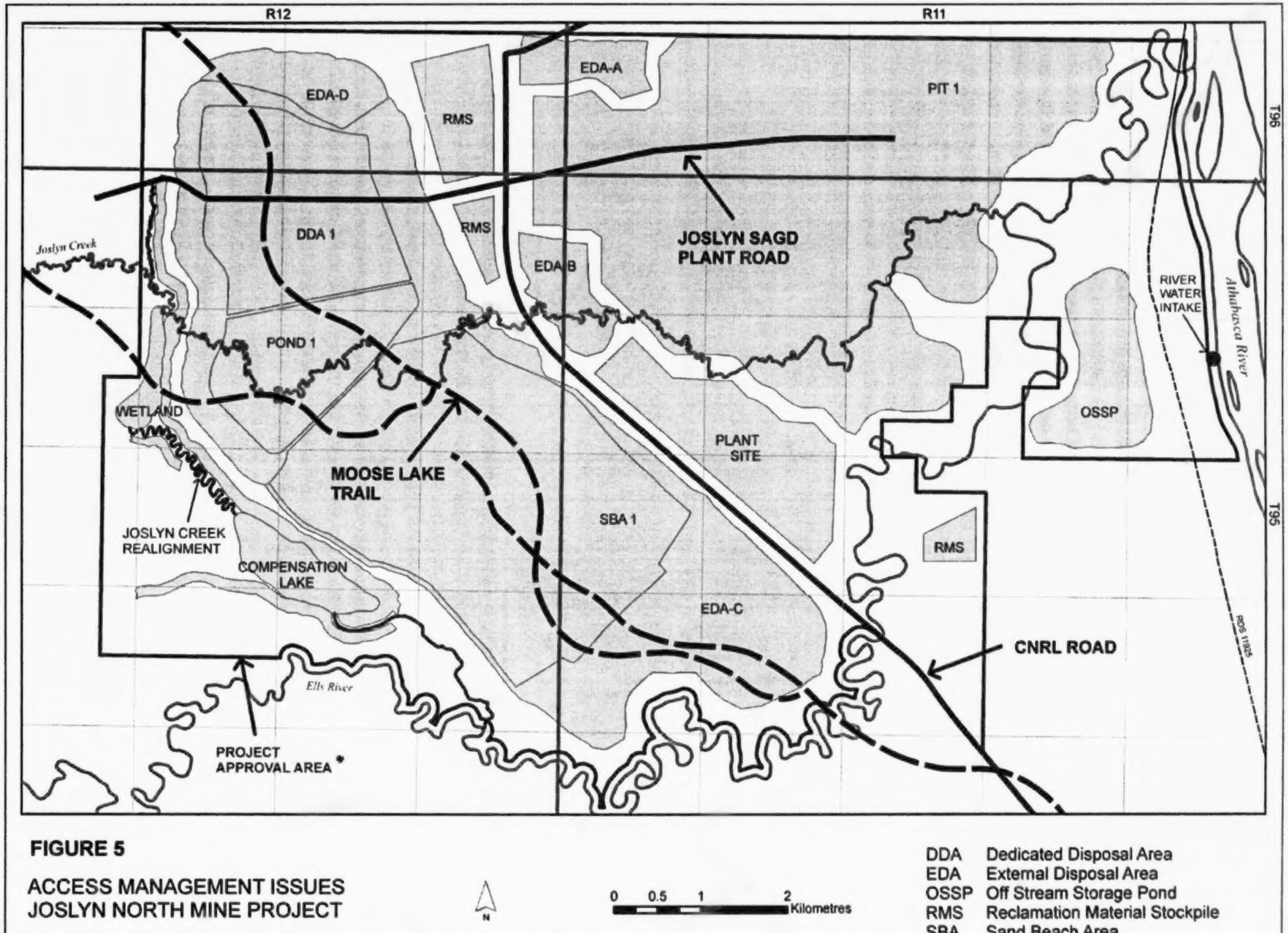
R12
R11
T96
T95
EDA-D
RMS
EDA-A
PIT 1
JOSLYN SAGD
PLANT ROAD
DDA 1
RMS
EDA-B
Joslyn Creek
POND 1
RIVER
WATER
INTAKE
Athabasca River
WETLAND
MOOSE LAKE
TRAIL
PLANT
SITE
OSSP
SBA 1
JOSLYN CREEK
REALIGNMENT
COMPENSATION
LAKE
RMS
EDA-C
CNRL ROAD
RDS 11925
Ells River
PROJECT
APPROVAL AREA *
N
0
0.5
1
2
Kilometres

FIGURE 5

ACCESS MANAGEMENT ISSUES
JOSLYN NORTH MINE PROJECT

DDA	Dedicated Disposal Area
EDA	External Disposal Area
OSSP	Off Stream Storage Pond
RMS	Reclamation Material Stockpile
SBA	Sand Beach Area

* Approval area setbacks from the Ells River and Athabasca River are subject to adjustments as discussed in the recommendations outlined in this report.

Non-Status Fort McMurray Band Descendants and Clearwater River Band No. 175

These groups stated that they were concerned about the interruption of their traditional access to the west of the proposed project on the Moose Lake Trail.

Government of Canada

EC recommended the development of an access management plan to address public access to lands around the project.

9.7.3 Panel Conclusions and Recommendations

The Panel acknowledges stakeholder concerns that the proposed project would eliminate existing access west of the lease and access to the Moose Lake Trail. The Panel notes that removal of access traditionally used by stakeholders would hinder both their access to lands west of the project and traditional land use. The Panel observes that TOTAL has committed to maintaining uninterrupted access to the Moose Lake Trail.

The Panel recommends that SRD complete the Moose Lake access management plan to provide uninterrupted public access to areas traditionally used west of the proposed project. The Panel requires that TOTAL maintain unimpeded access required for stakeholders to areas west of the project until the Moose Lake access management plan, or an equivalent, is implemented.

10 RECLAMATION

TOTAL submitted a conceptual closure, conservation, and reclamation plan as required by the *Environmental Protection and Enhancement Act*. The primary reclamation goal of the project would be to return disturbed lands to a capability equivalent to pre-development conditions and consistent with the end land use objectives. Reclamation includes the placement of overburden materials, recontouring of the landscape to resemble natural landforms, soil salvage, soil placement, and revegetation to meet equivalent land capability objectives.

10.1 Site Reclamation

10.1.1 Views of TOTAL

TOTAL stated that it addressed management strategies for mitigating the project's impacts and that establishing a capability equivalent to the predisturbed state was within its conceptual closure, conservation, and reclamation plan. The conceptual plan included development and reclamation mitigation strategies as required by the *Environmental Protection and Enhancement Act*. TOTAL noted that reclamation would include implementing progressive reclamation and meeting *Directive 074* requirements. TOTAL stated that as a result of its need for the tailings plan to comply with *Directive 074*, it would achieve a trafficable surface that would be ready for reclamation within five years of the last deposition of tailings. TOTAL stated that reclamation would begin once areas are safe, accessible, geotechnically stable and no longer needed for operations. TOTAL noted that reclaimed lands would be maintenance-free and have self-sustaining ecosystems.

TOTAL advised that it would consult with stakeholders to develop reclamation targets for end land use objectives and that it would apply several strategies to limit restrictions to attaining end land uses. The management strategies TOTAL proposed included

- following the Landscape Design Checklist;[44]
- applying progressive reclamation;
- incorporating adaptive management in reclamation planning; and
- monitoring causal factors and implementing corrective action to achieve acceptable performance levels.

TOTAL advised that it reviewed the *Landscape Design Checklist* early in the planning process and identified key objectives for reclamation and closure planning. Integration of the *Landscape Design Checklist* into the planning process included considering the mine planning elements of the checklist and the 10 desired characteristics/goals of the checklist, with consideration of the processes identified for evaluating landforms.

TOTAL stated that vegetation, wetlands, and landscape of the project's local study area would be different from the predevelopment situation due to project development. TOTAL advised that the project would cause a reduction of wetlands and a greater percentage of upland terrain features. TOTAL stated that with the topographic and site diversity planned for the closure landscape, it was confident that the landscape could be returned to healthy, sustainable, and diverse natural vegetation and wetland communities similar to natural areas in northeastern Alberta. TOTAL stated that the final conservation, closure, and reclamation plan for the project would be integrated and compatible with those of adjacent leaseholders.

TOTAL observed that discussions with stakeholders and findings from CONRAD and CEMA's Reclamation Working Group would help it achieve its reclamation objectives for equivalent capability. TOTAL stated that its approach would minimize the operation's active footprint and establish a self-sustaining natural landscape. TOTAL stated that about 60 per cent, or 5000 hectares, of the project's footprint would be vegetated by mine closure and that the remaining area would be reclaimed within seven years.

TOTAL confirmed its commitment to engage Fort McKay in all phases of reclamation, from developing plans, schedules, and operational strategies through to reclamation certification. TOTAL noted that it would design closure landforms to accommodate traditional land uses, where possible. It would plan planting prescriptions with the engagement of First Nations to provide a range of ecosite phases that support traditional end land uses. TOTAL stated that many of the species included in planting prescriptions are to provide habitat for wildlife species identified in traditional ecological knowledge and traditional land use information.

TOTAL committed to creating external disposal area landform shapes contoured to replicate natural terrain features, with no benching, that would blend into the surrounding landscape.

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[44] The *Landscape Design Checklist* was approved in 2005 by the Government of Alberta. TOTAL referenced the checklist in its application and used portions of it in its planning process but did not provide the document. The document can be found in Appendix 8.

TOTAL proposed to complement the landforms created by mine and tailings development with drainage patterns similar to the predevelopment landscape in order to manage erosion. TOTAL advised that it would use watershed designs that comprise a combination of wetlands, slope, ephemeral vegetated watercourses, and drainage channels to limit erosion and provide for long-term sustainability of major landforms.

TOTAL noted that drainage patterns would be similar to the predevelopment landscape. TOTAL stated that its objective was to create a self-sustaining pit lake with water quality that meets regulatory standards and that it would be similar to the quality of the water in the Athabasca River and non-toxic, capable of supporting aquatic life by the time it is filled. TOTAL indicated that the pit lake would be stocked with fish common to the surrounding area.

TOTAL stated that to facilitate reclamation, it would salvage subsoil and topsoil from disturbed areas and apply them to reclamation areas. Different soil types are selectively salvaged and either placed directly on prepared reclamation areas or placed in separate stockpiles for later use.

TOTAL stated that through the use of various techniques, it expected its revegetation efforts for upland sites to establish vegetative communities similar to predisturbed vegetation. It stated that the *Guidelines for Reclamation of Forest Vegetation in the Oil Sands Region* (CEMA, Reclamation Working Group) contains recommendations for establishing target upland ecosite phase vegetative communities. TOTAL noted that to establish ecosite options, the recommendations for different vegetative species should consider land use objectives, landscape, moisture availability, subsoil, soil, and chemistry. It noted that vegetation options depend on the soil and moisture considerations and the native vegetation source material that is required and available. TOTAL stated that wetland reclamation uses the recommendations of CEMA's *Guideline for Wetlands Re-establishment on Reclaimed Oil Sands Leases* to guide the development of landform design and vegetation required to establish a variety of wetlands. TOTAL noted that both CEMA and CONRAD continue to evaluate reclamation on oil sands mine disturbance and research improvements in reclamation technology desired by stakeholders.

TOTAL stated that it was a funding partner in several research projects involving local universities and other entities to find solutions in the areas of air emissions, water management, land reclamation, and biodiversity. TOTAL committed to reclaim ecosystems so that they resemble analogous natural ecosites to meet stakeholder needs and regulatory requirements. TOTAL said that it would establish a wide range of landscape, soil, and vegetation communities which, through succession, would reflect the predisturbance land capabilities and biodiversity of the region. TOTAL stated that it would maximize the use of direct placement of litter-fibric-humic and topsoil where practical. Further to this, TOTAL predicted that litter-fibric-humic soil would be placed directly on 28 per cent of disturbed areas. TOTAL stated that as development proceeded, it would meet its reclamation milestones as outlined in its application. TOTAL indicated that it expected to be held accountable for the success of its mine development and reclamation plans. TOTAL committed that the project would have a maximum disturbance of 5000 hectares based on the current mine plan. However, TOTAL advised that it would not want to commit to a maximum unreclaimed footprint of 5000 hectares because, although it intended to reclaim progressively, it needed to preserve flexibility around the area of disturbance as the mine plan could change and an approval clause to this effect would limit its development flexibility.

TOTAL stated that it understood that stakeholders were concerned about the viability of its reclamation and tailings management technology, but that it was confident it would accomplish its goals. TOTAL noted that it would actively participate in CEMA and committed to using the latest CEMA research and meeting regulatory requirements for predisturbed levels of equivalent land capability at closure. TOTAL stated that when mining concluded in the year 2037, it would complete reclamation within five to seven years of that date and certification 15 to 20 years after that. TOTAL stated that once reclamation was certified, public access and traditional activities could resume as vegetative communities matured and wildlife returned to the area.

10.1.2 Views of Interveners

Canadian Natural Resources Limited (Untested Evidence)

CNRL observed that the common lease boundary issues of mine structures, closure, conservation, and reclamation plans would directly impact both companies. CNRL was seeking a working relationship to resolve common problems created by the project. CNRL stated that closure, conservation, and reclamation plans along common boundaries would require coordination with TOTAL.

Athabasca Chipewyan First Nation (Untested Evidence)

The ACFN provided written statements that noted that TOTAL's primary reclamation methods were flawed. ACFN stated that TOTAL's belief that plant species would naturally recover in reclaimed sites over time through "successional processes" was unsupported by evidence. The ACFN stated that based on CEMA's research, no reclaimed areas that are similar in species composition and contain a similar number of species as naturally occurring, boreal forest stands exist.

The ACFN advised that without planting a wide range of species in the initial period of reclamation, it would be unlikely that the ecosites targeted for reclamation would bear any resemblance to predisturbed ecosites. The ACFN noted that specific targets for each ecosite or wetland type to be reclaimed should be developed to fully evaluate the success of reclamation.

Fort McKay First Nation and Métis Nation Local #63 (Untested Evidence)

In its Traditional Land Use Report, Fort McKay stated that one of its main concerns was that reclamation planning would not restore the land back to a state that would enable continued traditional land use within the lifetime of current land users.

Mikisew Cree First Nation (Untested Evidence)

The MCFN provided written statements that reclamation practices have not re-established vegetation and wildlife diversity similar to predisturbance conditions and are unlikely to do so in the future. MCFN noted that it has become increasingly concerned about the time required to successfully achieve closure. The MCFN expressed concern about the lack of measurable reclamation requirements and monitoring that would define successful reclamation. The MCFN believed that the rivers, wetlands, and vegetative communities could not be reclaimed to anything that resembled predevelopment conditions. The MCFN observed that equivalent capabilities for traditional land use would require that landscapes, watersheds, soil, and vegetation support predisturbed level of wildlife populations. The MCFN stated that it would be important to ensure that aboriginal standards for reclamation are achieved, with the return of an acceptable and fully-functional landscape for both the project area and on a regional basis.

The MCFN noted that revegetation efforts should be compatible with end land use and land management objectives as agreed to by the MCFN and others using the land base. The MCFN stated that performance measures and indicators of success should be developed to measure progress toward agreed outcomes. The MCFN indicated that reclamation should include the use of traditional use plant species and conserve rare plant species.

The MCFN stated that reclamation plans that involve permanent aboveground storage of weak tailings material within landforms were questionable because, over time, erosion gullies could expose them and release the tailings to the environment.

Non-Status Fort McMurray Band Descendants and Clearwater River Band #175

These groups were concerned that development of the project would result in the loss of forests, habitat, fish, and wildlife that the members use to support themselves. These groups stated that they believed reclamation would require more than 50 years and would result in the loss of their members' opportunity to use the lands for a lifetime.

Oil Sands Environmental Coalition

OSEC expressed concern that reclaiming the project would take longer than predicted based on the reclamation history of the oil sands industry. OSEC questioned TOTAL's ability to fulfill its commitment to achieve trafficable tailings deposits within the timeframe required by *Directive 074*. OSEC stated that the objective of *Directive 074* was to modify tailings into a trafficable material that could be reclaimed within five years. OSEC also questioned the amount of time that TOTAL would need to certify the reclaimed lands to AENV's standards. OSEC observed that TOTAL committed to complete mine reclamation within seven years of mine closure in year 2037.

OSEC observed TOTAL's commitment to use direct placement of soils for 28 per cent of the development area but questioned why direct placement of litter-fibric-humic soil received such limited use. OSEC asked if TOTAL would share the direct placement material with surrounding mines to prevent seed sterilization in storage piles. OSEC stated that there was a need for accountability for adequate reclamation.

Sierra Club Prairie

Sierra Club Prairie stated that it was concerned about the potential for vegetative species succession, the timeline, and the reclamation requirements in developing biodiverse vegetation and wildlife communities.

Mike Guertin

Mr. Guertin said that he was concerned about the time needed to reclaim the project and the public's inability to enter or use the land during reclamation.

He observed that areas of some oil sands mines have been reclaimed for years, and he questioned how long the public would have to wait before they could freely enter reclaimed lands. Mr. Guertin questioned whether the plants and animals on reclaimed lands were contaminated and whether they would be suitable for human consumption.

Government of Canada

EC stated that its recommendations were guided by the principle that the project, if approved, should be planned, built, operated, and decommissioned in a manner that ensures the highest level of environmental stewardship through conservation, mitigation, and reclamation. EC stated that it continued to see value in CEMA. EC stated that it would be important for TOTAL to continue its involvement in CEMA, associated working groups, and technical teams.

10.1.3 Panel Conclusions and Recommendations

The Panel believes that reclamation is a central mitigation strategy to address regional environmental sustainability issues that require adaptive management strategies. The Panel recognizes that oil sands mine development significantly disrupts the watershed, soil, ecosystems, and wildlife within a project's footprint.

The Panel understands that in order for reclamation to sufficiently restore the natural and ecological environment to predisturbed levels of equivalent capability, significant planning, effort, resources, and time are necessary. The Panel expects TOTAL to implement its proposed progressive reclamation strategy to meet its regulatory requirements for returning the landscape to predisturbed levels of equivalent capability. The Panel notes that Fort McKay, in its closing argument, was looking for defined reclamation standards. Fort McKay requested that the development of these standards should be done in consultation with them in an attempt to address its traditional land use requirements.

The Panel finds that returning disturbed lands to a condition that is acceptable to SRD, AENV, and stakeholders within the established time frames is required in the public interest. The Panel finds that to achieve appropriate reclamation at mine closure requires project planning and development to address the reclamation and closure requirements from the start of mine planning for the project.

The Panel observes that CEMA has been helpful in developing environmental management strategies to address the environmental impacts of oil sand development. The Panel supports TOTAL's commitment to participate in CEMA and its subcommittees and use all of their recommendations to meet regulatory requirements of equivalent capability at closure. The Panel requires that TOTAL actively support and participate in the CEMA and other regional committees to develop and use its strategies to mitigate both development and regional cumulative environmental effects.

The Panel notes TOTAL's proposal to limit the unreclaimed project disturbance to 5000 hectares. TOTAL advised that an approval clause to this effect would limit its development flexibility due to potential mine plan amendments. The Panel has observed that there are and will be cumulative effects from harvesting and industrial development both in the regional study area and regionally that will require a concerted effort by all developers to mitigate. The Panel requires that TOTAL limit the area of disturbance to 5000 hectares or less.

The Panel agrees with stakeholders that biodiversity is a key reclamation challenge that is necessary for the return to equivalent capability for end land use. The Panel notes that TOTAL stated that biodiversity would increase through succession over time. The Panel notes the stakeholders' concerns that TOTAL's commitment to use 28 per cent of the available litter-fibric-humic material is not adequate to return reclaimed lands to a state that would be sufficiently comparable to a predisturbed ecosystem. The Panel recognizes that there may be a significant lag time before the latest improvements to reclamation technologies and resulting vegetative biodiversity become visible on the landscape. The Panel observes that the approach proposed by TOTAL to establish biodiversity on reclaimed lands uses some of the research and science determined by CEMA needed to establish a biodiverse post-reclamation landscape. The Panel is concerned that TOTAL expects an increase in vegetative biodiversity over time from succession if the species are not established during reclamation. The Panel recommends that AENV establish measurable targets for increased indigenous vegetative biodiversity in the reclaimed landscape and the postclosure landscape.

The Panel notes that TOTAL committed to addressing the mine planning elements and ten desired characteristics of the *Landscape Design Checklist*, early in its planning process for reclamation and closure planning. The Panel expects TOTAL to implement the *Landscape Design Checklist* for all of its mine development. The Panel supports TOTAL's plan for developing landform shapes contoured to replicate the features of natural terrain, with no benching, that would blend into the surrounding landscape. The Panel supports that TOTAL committed to watershed designs that use a combination of wetlands, slope, and ephemeral vegetated watercourses to manage water drainage and control erosion. The Panel supports TOTAL's commitment to implement landform design that replicates the features of natural terrain and blends into the surrounding landscape. The Panel finds that standards and approvals are required for appropriately and consistently implementing discard management to establish land use capabilities in the closure landscape. The Panel requires that TOTAL remove all benching on mine discard structures prior to reclaiming them. The Panel also requires that TOTAL provide sustainable watershed designs with vegetated watercourses for geotechnical design applications for mine discard structures. Landform watershed designs should be consistent with regionally recognized guidelines for the purpose of erosion management.

10.2 Mine Reclamation Across Lease Boundaries

CNRL and TOTAL are working on the lease boundary between the companies in order to coordinate mining and reclamation.

10.2.1 Views of TOTAL

TOTAL stated that it was working with CNRL to coordinate their respective mine plans along the common lease boundary. TOTAL advised that at the time of the hearing the lease boundary plan had not been finalized.

TOTAL stated that it planned to integrate reclamation and water management plans along the common lease boundary with CNRL. TOTAL stated that it required the boundary areas north of external dump areas A and D for the routing and transport of drainage water. TOTAL advised that the watershed for each mine would flow independently along the lease boundary. TOTAL said that it would work with CNRL to develop an integrated reclamation plan with integrated management of watersheds. TOTAL confirmed that its current mine plan and that of CNRL both have landforms with slopes leading up and away from the drainage channels along the common lease boundary. TOTAL stated that the closure landscape at the end of mine life would support sustainable, natural ecological processes.

10.2.2 Views of the Interveners

Canadian Natural Resources Limited (Untested Evidence)

CNRL stated that it would be in the best interest of TOTAL and CNRL to work together on issues that affect both the Horizon and Joslyn North mine projects. CNRL stated that it had identified aspects in TOTAL's proposed mine plan that could impact the common lease boundary and intended to work directly with TOTAL to resolve the issues.

Government of Alberta (Untested Evidence)

In its written submission, SRD stated that the development falls within the Athabasca-Clearwater and the Mildred-Kearl Lakes regional management areas of the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan. SRD advised that the management intent of the Mildred-Kearl Integrated Resource Management Area is to "promote the orderly planning, exploration and development of resources with emphasis on the area's oil reserves." SRD further advised that the management intent of the Athabasca-Clearwater Resource Management Area is to "protect the natural landscape, which encompasses water, wildlife habitat, ecological and geological features, to ensure aesthetic, recreational, traditional and environmental values." SRD explained that exploration and development of oil sands resources would be considered only if the proponent could demonstrate that the adverse impacts could be satisfactorily mitigated.

10.2.3 Panel Conclusions and Recommendations

The Panel understands that reclamation of mine development across lease boundaries has been an issue within the oil sands mine area since oil sands mines have shared lease development boundaries. Detailed and measurable expectations for oil sands mine inter-lease landscape coordination, development, and reclamation need to be established. The establishment of interlease landscape design requirements would enable the assessment of design suitability for next land use.

The Panel notes that SRD, in its written submission, advised that the development falls within the Athabasca-Clearwater and the Mildred-Kearl Lakes regional management areas of the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan. SRD advised that the management intent of the Mildred-Kearl Integrated Resource Management Area is to "promote the orderly planning, exploration and development of resources with emphasis on the area's oil reserves." SRD further advised that the management intent for the Athabasca-Clearwater Resource Management Area is to "protect the natural landscape, which encompasses water, wildlife habitat, ecological and geological features, to ensure aesthetic, recreational, traditional and environmental values." SRD explained that exploration and development of oil sands resources would be considered only if the proponent could demonstrate that the adverse impacts could be satisfactorily mitigated.

The Panel notes that in the Imperial Oil application for the Kearl Oil Sands Project, the Government of Alberta stated that it expected reclaimed landscapes to have a natural appearance and function consistent with boreal forest. The Government of Alberta observed that coordinating reclamation between adjacent oil sands mine developments was necessary to ensure the continuity and integration of drainage, landform design, and vegetation patterns, to manage runoff water from reclaimed land, and to coordinate the end land-use plans on a regional basis.

The Panel observes that the lack of landscape and drainage water route coordination requirements leaves operators to work within their leases. This results in a landform and watershed setback from common lease boundaries. From a landscape perspective, the setback strategy results in a trench several miles long with parts of the area used to route drainage water.

The Panel notes that TOTAL committed to work with CNRL to coordinate the integration of closure plans along the common lease boundary. The Panel observes that the project does not appear to have addressed landform integration across the common lease boundary with CNRL. The Panel observes that there is an opportunity to use the inter-lease area, where drainage waters could be redirected, to store large volumes of mine discard; this could reduce the environmental footprint of oil sands mining. The Panel notes that maps in the application show the proposed mine boundary setbacks between the Joslyn North Mine Project and Horizon mines would leave a trench 50 to 60 metres deep and 200 to 300 metres wide that, in part, would contain site drainage. The Panel observes that north of sand beach area three, the trench area would receive minimal drainage and could provide significant capacity for discard storage. The Panel observes that use of the trench area north of sand beach area three for discard storage could reduce the area required for discard storage in other areas and potentially reduce the environmental impacts in other areas of the project.

The Panel notes that landscape and landform design for the creation of functional closure landscapes would require planning and operational participation by both TOTAL and CNRL. The Panel observes that in *ERCB Decision Report 2004-005: Canadian Natural Resources Limited, Application for an Oil Sands Mine, Bitumen Extraction Plant, and Bitumen Upgrading Plant in the Fort McMurray Area, January 27, 2004,* for CNRL's Horizon mine project, CNRL stated that it was committed to limiting the surface disturbance footprint by reuse of previously disturbed areas, and that panel noted that the oil sands industry should limit the amount of land disturbed at any given time.

In the EUB Decision 2007-013: Imperial Oil Resources Ventures Limited, Application for an Oil Sands Mine and Bitumen Processing Facility (Kearl Oil Sands Project) in the Fort McMurray Area, February 27, 2007, views of that panel were as follows:

"The Joint Panel acknowledges and fully supports the need for coordination of mine, landform, water management, and reclamation plans both within and across lease boundaries. The Joint Panel recommends that Alberta, with the support of the EUB, establish a collaborative process to develop a mechanism to ensure that the coordination of mine, landform, water management, and reclamation plans occurs on an industry-wide basis, both within and across lease boundaries. The Joint Panel expects Imperial Oil to participate in and comply with recommendations of the initiative. The Joint Panel believes that this initiative should be given a high priority by Alberta."

The Panel recognizes that achievement of the EUB Decision 2007-013: Imperial Oil Resources Ventures Limited, Application for an Oil Sands Mine and Bitumen Processing Facility (Kearl Oil Sands Project) in the Fort McMurray Area, February 27, 2007, objectives for mine and landform coordination have not been completed to date. The Panel understands that inter-lease landform design and reclamation is a complex issue that has not been well defined. The Panel observes that requirements for mine planning to develop reclaimed mine boundaries with the desired attributes is a responsibility shared between the oil sands industry, ERCB, AENV, and SRD. The ERCB approves landform placement and design as part of its mandate under Oil Sands Conservation Regulation requirements for discard management. The Oil Sands Conservation Regulation requires efficient management of discard to create geotechnically safe and stable structures. The ERCB is responsible for watershed design that supports maintenance-free and structurally-stable landforms. SRD has stated objectives for landform designs to have natural appearances and be suitable for the next land use. AENV's reclamation objectives for landforms are to establish requirements for equivalent capability through the placement of topsoil and vegetation. The Panel understands that AENV intends to review and coordinate oil sands mine closure and reclamation plans for all oil sands mines in 2011.

Alberta policy and agreements that guide oil sands mine development include the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan, the End Land Use Committee Recommendations, and the Regional Sustainable Development Strategy. The Panel finds that each government agency requirement for reclamation is fundamentally affected by the ERCB's approval of mine design and discard management. The Panel observes that it would be inefficient to move a significant volume of discard after placement to meet AENV or SRD requirements and potentially affect the geotechnical stability of a structure.

The Panel finds that efficient discard management is required to create landscapes that meet the inter-lease landform design requirements to provide the capability for functional land use in the closure landscape. The Panel finds that equivalent land capability means that functional attributes of land use include logical, sustainable, and integrated landform and watershed design that is suitable for the next land use. The Panel notes that in the Kearl hearing, SRD observed that functional land use meant landscapes with a natural appearance and an integrated watershed design that also meet AENV and ERCB requirements. The Panel finds that a trench running the length of the common lease boundary between the CNRL and TOTAL projects does not meet the reclamation guidance provide by the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan.

The Panel recommends that AENV, SRD and the ERCB work collaboratively to establish direction and standards required for interlease oil sands mine watershed and landform design coordination. The initiative should address legislation and/or regulation requirements and consider recommendations of the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan, the End Land Use Committee Recommendations, the Regional Sustainable Development Strategy, and any other requirement that may be established by Alberta to guide oil sands mine development on public lands.

The Panel notes that landscape and landform design for the creation of functional closure landscapes along their common mine boundary would require long-range planning and operational participation by both TOTAL and CNRL. The Panel notes that TOTAL has not demonstrated that it has established an integrated landscape, or landforms, for the inter-lease area between CNRL and TOTAL oil sands mines. In the area between the two mines, TOTAL and CNRL would need to maximize discard storage and potentially provide for landscape drainage where appropriate.

The Panel requires TOTAL to provide an amended mine plan to demonstrate an integrated landform and landscape design plan for the CNRL – TOTAL common mine boundary to the ERCB for approval five years prior to development. The amended plan must include a discussion of the feasibility of filling the trench area between the Joslyn North and Horizon projects with mine discard. The amended mine plan must include a discussion of the alternatives considered by TOTAL.

The Panel notes that TOTAL must work in consultation and cooperation with CNRL to meet this requirement and that both companies said that they would do so.

11 LIABILITY MANAGEMENT

11.1 Views of TOTAL

TOTAL stated that it would be responsible for all reclamation costs associated with the project. It noted that standing behind TOTAL E&P Joslyn Limited were TOTAL E&P Canada Limited and TOTAL SA, companies with significant resources and strong corporate reputations. TOTAL said that it would comply with regulatory requirements that cover reclamation liability.

11.2 Views of Interveners

Mikisew Cree First Nation (Untested Evidence)

MCFN recommended that Alberta, with input from MCFN, finalize the Oil Sands Mine Liabilities Management Program, now the Mining Financial Security Program.

Oil Sands Environmental Coalition

OSEC stated that it was concerned that TOTAL was structured such that TOTAL E&P Canada Limited and TOTAL SA would not bear any of the liability associated with development of the project. OSEC noted that it had concerns about who would ultimately be responsible for the liability associated with the project.

OSEC said that the narrow definition of financial liability used by AENV underestimates the actual liabilities that would be borne by Albertans should an oil sands mine become insolvent. It further noted that its analysis suggested that AENV and oil sands operators had significantly underestimated the actual cost of addressing environmental liabilities. This, OSEC said, led to the collection of security that was not sufficient to address actual liabilities borne should TOTAL be unable to address its obligations.

OSEC expressed concern about the absence of transparency in the current mine reclamation security program. It noted that much of the material submitted to government is inaccessible to third parties and is unavailable from industry directly.

OSEC noted that the Government of Alberta has been developing a Mine Liability Management Program since 2004, now renamed the Mining Financial Security Program. OSEC expressed concern about the lack of transparency in the development of the Mining Financial Security

Program. It noted that there had been consultation between industry and government but that other stakeholders had not had the same opportunity.

OSEC recommended that the ERCB collect additional security to address the issues identified by OSEC.

11.3 Panel Conclusions and Recommendations

The Panel acknowledges that work is under way on a new Mine Liability Management Program and encourages Alberta to finalize that program. The Panel expects that TOTAL would fully comply with the new program when it is implemented and that it would meet any disclosure obligations of that program.

12 END PIT LAKE

12.1 Views of TOTAL

TOTAL stated that there would be one end pit lake free of mature fine tailings in the closure landscape. The end pit lake would have an area of 2.3 square kilometres and a storage capacity of 54 million cubic metres. The end pit lake would take six years to fill and commence in 2038. To fill the end pit lake, TOTAL would use various sources of water, such as surface runoff, the Athabasca River, process-affected water inventory from both pond 2 and dedicated disposal area 2 at closure, and porewater from tailings consolidation in dedicated disposal areas.

TOTAL indicated that groundwater would not be a major source of water during the pit lake filling period. Groundwater inflow into the pit lake would decrease with time from sedimentation at the bottom and sides of the lake, resulting in increased resistance to groundwater seepage.

TOTAL stated that when the water inside the end pit lake reaches 243 metres above sea level and is of suitable quality for release, the end pit lake would discharge into the Ells River via the remaining section of the Joslyn Creek channel.

TOTAL predicted that concentrations of most constituents would remain within the natural variation observed in local water bodies and watercourses. TOTAL predicted that concentrations of polycyclic aromatic hydrocarbon groups two and six would increase above natural variation, but would remain below chronic effects benchmarks.

TOTAL predicted that increased concentrations of labile and refractory naphthenic acids in the end pit lake would be 0.71 and 9.7 milligrams per litre respectively in 2044 and would decline over time. TOTAL indicated that naphthenic acids have no acute or chronic effects benchmarks. TOTAL stated that the labile fraction was more toxic than the refractory fraction and that, at less than 1 milligram per litre, it represented a lesser portion of the total concentration of naphthenic acids. Based on these concentrations, TOTAL considered the potential changes in the concentrations of naphthenic acids to be of negligible ecological importance.

TOTAL stated that at the time of initial discharge and into the far-future, chronic and acute toxicity would be well below threshold values of 1.0 chronic toxicity units and 0.3 acute toxicity units, respectively. TOTAL indicated that fish tissue concentrations would be below benchmarks for all constituents except cadmium and nickel; however, TOTAL predicted that water concentrations of both of these constituents would remain within the levels observed in natural lakes.

TOTAL has committed to

- implementing active water treatment if the water quality in the end pit lake does not meet discharge standards at the time of the planned release, such as using ozonation, bioreactors, irradiation, carbon filtration, or nanofiltration or applying adsorptive media;
- continuing to actively participate in CEMA's end pit lake committees by gathering information from monitoring conducted at other operational pit lakes when available and incorporating the relevant findings into the design and construction of its end pit lake; and
- monitoring water quality in the end pit lake once it begins filling it to evaluate whether the water meets discharge criteria; the release of end pit lake water would commence once compliance with appropriate discharge conditions is met.

TOTAL concluded that the effects of the predicted end pit lake water quality on aquatic health were insignificant. TOTAL stated that it expects the end pit lake to be able to support a viable aquatic ecosystem at the time of initial release at closure and into the far-future.

12.2 Views of Interveners

Oil Sands Environmental Coalition and Sierra Club Prairie

OSEC stated that TOTAL has not proven that end pit lakes are technically or economically feasible for oil sands applications. OSEC indicated that TOTAL did not provide viable alternatives in case its proposed end pit lake does not perform as predicted. OSEC indicated that end pit lakes have been approved without prior demonstration of their ability to become maintenance-free, self-sustaining aquatic ecosystems.

OSEC stated that TOTAL relied on CEMA's End Pit Lake Technical Guidance document to predict the viability of the end pit lake. OSEC indicated that CEMA appointed CH2M Hill to review this document and that CH2M Hill concluded that the information on end pit lakes presented in the document was insufficient. OSEC stated that TOTAL only cited one peer-reviewed paper on end pit lakes (L. I. Bendell-Young et al., February 2000)[45] and that the peer-reviewed paper did not support the concept of the end pit lake as an effective reclamation method.

OSEC and Sierra Club Prairie stated that salinity and high levels of contaminants in process-affected waters would be detrimental to a viable and ecologically sustainable end pit lake. OSEC and Sierra Club Prairie stated that the final inventory of process-affected water from both pond 2 and dedicated disposal area 2 plus the pore-water released from dedicated disposal areas account for 15 of the 54 million cubic metres total storage capacity in the end pit lake.

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[45] L. I. Bendell-Young, K. E. Bennett, A. Crowe, C. J. Kennedy, A. R. Kermode, M. M. Moore, A. L. Plant, And A. Wood, 2000, Ecological Characteristics of Wetlands Receiving an Industrial Effluent

OSEC and Sierra Club Prairie stated a concern that the end pit lake would discharge water with high levels of contaminants and salinity into the Ells River. OSEC and Sierra Club Prairie stated that TOTAL did not include a proper contingency plan in case water quality in the end pit lake did not meet release criteria. OSEC and Sierra Club Prairie indicated that the three methods TOTAL proposed for treating end pit lake water did not guarantee that the quality of the water would be suitable for release.

OSEC and Sierra Club Prairie stated that according to TOTAL, all water quality variables would return to baseline case conditions in the far-future. OSEC stated that in the far-future, predicted concentration of pollutants, and acute and chronic toxicity in end pit lake water would be higher than baseline conditions; therefore, it's uncertain how TOTAL's plan would be accomplished.

OSEC and Sierra Club Prairie recommended that TOTAL assess the viability of the proposed end pit lake and what alternatives it would use if the end pit lake does not perform as predicted. OSEC recommended that TOTAL verify the predicted salinity and contaminant load of the process-affected water that it would pump into the end pit lake.

Government of Canada

EC, due to undisclosed model uncertainties and the lack of provision of confidence limits on TOTAL's model outputs, expressed concerns about the accuracy of predicted end pit lake water quality, and the long-term performance of end pit lakes. EC stated that the ability of end pit lakes to degrade contaminants has not yet been demonstrated. EC stated that it was concerned that gradual degradation of polycyclic aromatic hydrocarbons, metals, and naphthenic acids may not occur as predicted and, in the long term, may adversely affect aquatic life and habitat in the end pit lake, wetlands, and receiving streams. EC recommended that TOTAL provide a functional plan to hold and treat end pit lake waters that do not meet release criteria.

EC stated that TOTAL should update, refine, and validate the models it applied to the project on a regular basis, as data becomes available or when monitored data differs from model predictions. EC stated that TOTAL should make the monitoring data available for peer review on a public Web site.

12.3 Panel Conclusions and Recommendations

End pit lakes have been proposed as an integral part of mineable oil sands projects reclamation and closure plans. The Panel acknowledges that end pit lakes have been approved in concept, subject to successful full-scale demonstration. The Panel notes that in previous decisions, EUB[46] *Decision 2004-009: Shell Canada Limited, Applications for an Oil Sands Mine, Bitumen Extraction Plant, Cogeneration Plant, and Water Pipeline in the Fort McMurray Area, February 5, 2004*, and EUB *Decision 2006-128: Albian Sands Energy Inc., Application to Expand the Oil Sands Mining and Processing Plant Facilities at the Muskeg River Mine, December 17, 2006*, it was requested that the efficacy of end pit lakes be proven within 15 years following 2003. The Panel recognizes that TOTAL's proposal to have an end pit lake without tailings is a positive step towards the responsible management of tailings, potential toxicity, and liability. However, the Panel notes that to date, there is not any sound evidence to indicate that end pit lakes work as functional self-sustaining aquatic ecosystems. The Panel expects mineable oil sands operators to meet the deadlines for demonstrating the efficacy of end pit lakes.

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[46] EUB stands for Alberta Energy and Utilities Board

The Panel notes OSEC and Sierra Club Prairie's concerns regarding the absence of alternatives for the proposed end pit lake if it does not perform as predicted, and the lack of evidence that the three suggested end pit lake water treatment methods would guarantee suitable water quality for release.

The Panel recognizes the concerns of interveners with respect to the potential for high levels of naphthenic acids, polycyclic aromatic hydrocarbons, salts, and metals in the end pit lake water that would discharge into the Ells River at closure and in the far-future and the resulting impacts on aquatic life and habitat. The Panel acknowledges OSEC, Sierra Club Prairie, and Government of Canada's concerns regarding the lack of clear direction for managing end pit lake water that is unsuitable for release. The Panel recommends that AENV include water quality management conditions in any *Environmental Protection and Enhancement Act* approval it may issue, to specifically address this concern and ensure that the water in TOTAL's end pit lake meets release quality criteria at closure.

The Panel understands that TOTAL used CEMA's End Pit Lake Technical Guidance document in the design of the proposed end pit lake and that this document requires refining and updating as recommended by CH2M Hill. The Panel notes OSEC and Sierra Club Prairie's concern with the insufficiency of information on end pit lakes, and recommends that CEMA's end pit lake committees address the CH2M Hill's recommendations and additional recommendations from scientific peer reviews in the 2012 End Pit Lake Technical Guidance document update.

The Panel acknowledges TOTAL's proposal for one end pit lake, with no mature fine tailings, in the closure landscape. As per TOTAL's commitments, the Panel requires TOTAL to submit an annual report to the ERCB, starting two years prior to commencing mining operations, that describes its end pit lake research and development efforts for the previous year, and the current plans and timelines for determining the efficacy of its end pit lake within seven years of mine closure. This report will include all of TOTAL's efforts and contributions with respect to collaboration on the demonstration of a full scale end pit lake.

The Panel notes that the initial volume of process-affected water in TOTAL's end pit lake would be 11 million cubic metres. The Panel also notes that at the end of the six-year filling period, the volume of porewater released into the lake would be an additional 4 million cubic metres.

The Panel recommends that AENV include the following requirements in any *Environmental Protection and Enhancement Act* approval that it may issue, for TOTAL to

- provide functional plans to monitor end pit lake water quality and assess treatment options that TOTAL would implement to meet end pit lake water release criteria within seven years of mine closure;
- provide functional plans to ensure that the volume of process-affected water and porewater in the end pit lake does not exceed 15 million cubic metres, and

- refine, update, and validate the models used for predicting water quality in the end pit lake based on characterization of the process-affected water that TOTAL plans to transfer into the lake.

The Panel expects TOTAL to continue its participation in CEMA's End Pit Lake Committee and work with regional working groups and stakeholders to research and refine assumptions regarding end pit lake development.

The Panel concludes that with the implementation of TOTAL's proposed mitigation measures and commitments and the Panel's recommendations, it is unlikely that significant environmental effects would result from using the proposed end pit lake.

Dated in Calgary, Alberta, on January 27, 2011.

ENERGY RESOURCES CONSERVATION BOARD
CANADIAN ENVIRONMENTAL ASSESSMENT AGENCY

'Original signed by'

J.D. Dilay, P.Eng.
Panel Chair

'Original signed by'

B. Ross, Ph.D.
Panel Member

'Original signed by'

D. McFadyen
Panel Member

APPENDIX 1 ACRONYMS AND ABBREVIATIONS USED IN THIS REPORT

Acronym/Abbreviation	Definition
Al-Pac	Alberta Pacific Forest Industries Inc.
ACFN	Athabasca Chipewyan First Nation
AENV	Alberta Environment
CEMA	Cumulative Environmental Management Association
CNRL	Canadian Natural Resources Limited
CONRAD	Canadian Oil Sands Network for Research and Development
DFO	Fisheries and Oceans Canada
EC	Environment Canada
ERCB	Energy Resources Conservation Board
EPA	Environmental Protection Agency
Fort McKay	Fort McKay First Nation and Métis Nation Local #63
HC	Health Canada
MCFN	Mikisew Cree First Nation
NRCan	Natural Resources Canada
OSEC	Oil Sands Environmental Coalition

Acronym/Abbreviation	Definition
Panel	Joint Review Panel
the project	Joslyn North Mine Project
RAMP	Regional Aquatics Monitoring Program
RMWB	Regional Municipality of Wood Buffalo
SRD	Alberta Sustainable Resource Development
TOTAL	TOTAL E&P Joslyn Ltd.
WBEA	Wood Buffalo Environmental Association

APPENDIX 2 AGREEMENT TO ESTABLISH A PANEL

AGREEMENT

To Establish a Joint Panel
for the Joslyn North Mine Project
Between
The Minister of the Environment, Canada
- and -
The Energy Resources Conservation Board, Alberta

PREAMBLE

WHEREAS the Energy Resources Conservation Board (the ERCB) has statutory responsibilities pursuant to the *Energy Resources Conservation Act*; and

WHEREAS the Minister of the Environment, Canada (the Federal Minister of the Environment) has statutory responsibilities pursuant to the *Canadian Environmental Assessment Act*; and

WHEREAS the Joslyn North Mine Project (the Project) requires a public hearing and approvals from the ERCB pursuant to the *Energy Resources Conservation Act*, and the *Oil Sands Conservation Act*, and is subject to an assessment under the *Canadian Environmental Assessment Act*; and

WHEREAS the Minister of Fisheries and Oceans has requested, in accordance with section 25 of the *Canadian Environmental Assessment Act*, that the Federal Minister of the Environment refer the Project to a review panel; and

WHEREAS the Federal Minister of the Environment has referred the Project to a review panel in accordance with section 29 of the *Canadian Environmental Assessment Act*; and

WHEREAS the Government of the Province of Alberta and the Government of Canada established a framework for conducting Joint Panels through the *Canada-Alberta Agreement on Environmental Assessment Cooperation (2005)* signed on May 17, 2005; and

WHEREAS the ERCB and the Federal Minister of the Environment have determined that a Joint Review Panel of the Project will ensure that the Project is evaluated according to the spirit and requirements of their respective authorities while avoiding unnecessary duplication, delays and confusion that could arise from individual reviews by each government or the ERCB; and

WHEREAS the ERCB and the Federal Minister of the Environment have determined that a Joint Review Panel of the Project should be conducted in a manner consistent with the provisions of Appendix 2 of the *Canada-Alberta Agreement on Environmental Assessment Cooperation (2005)*; and

WHEREAS the Federal Minister of the Environment has determined that a Joint Panel should be established pursuant to paragraph 40(2) of the *Canadian Environmental Assessment Act* to consider the Project; and

WHEREAS the ERCB agrees that a joint panel cooperative proceeding should be established and that the project should be considered in a cooperative proceeding with the ERCB and the Agency pursuant to section 22(2) of the *Energy Resources Conservation Act*;

THEREFORE, the ERCB and the Federal Minister of the Environment hereby establish a Joint Panel for the Project in accordance with the provisions of this Agreement and the Terms of Reference attached as an Appendix to this Agreement.

1. Definitions

For the purpose of this Agreement and of the Appendix attached to it,

"Agency" means the Canadian Environmental Assessment Agency established by the *Canadian Environmental Assessment Act.*

"EIA Report" means an environmental impact assessment report prepared in accordance with the Terms of Reference issued for the Project by the Director of Environmental Assessment, Alberta Environment.

"Environment" means the components of the Earth, and includes

a. land, water and air, including all layers of the atmosphere;

b. all organic and inorganic matter and living organisms; and

c. the interacting natural systems that include components referred to in (a) and (b).

"Environmental Effect" means, in respect of the Project,

a. any change that the Project may cause in the Environment, including any change it may cause to a listed wildlife species, its critical habitat or the residence of individuals of that species, as those terms are defined in subsection 2(1) of the *Species at Risk Act*,

b. any effect of any change referred to in paragraph (a) on

   i. health and socio-economic conditions

   ii. physical and cultural heritage

   iii. the current use of lands and resources for traditional purposes by aboriginal persons, or

   iv. any structure, site or thing that is of historical, archaeological, paleontological or architectural significance, or

c. any change to the Project that may be caused by the environment, whether any such change or effect occurs within or outside Canada.

"Federal Authority" refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

"Report" means the document produced by the Joint Panel, which contains decisions pursuant to the *Energy Resources Conservation Act* or the *Oil Sands Conservation Act*, and the Joint Panel's rationale, conclusions and recommendations, including any mitigation measures and follow-up program pursuant to the *Canadian Environmental Assessment Act* with respect to the environmental assessment (EA) of the Project.

"Follow-up Program" means a program for

a. verifying the accuracy of the EA of the Project, and

b. determining the effectiveness of any measures taken to mitigate the adverse environmental effects of the Project.

"Joint Panel" refers to the Joint Review Panel established by the ERCB and the Federal Minister of the Environment through this Agreement.

"Mitigation" means, in respect of the Project, the elimination, reduction or control of the adverse environmental effects of the Project, and includes restitution for any damage to the environment caused by such effects through replacement, restoration, compensation or any other means.

"Parties" means the signatories to this Agreement.

"Public Registry" means a repository to facilitate public access to the records relating to the EA of the Project in accordance with section 55 of the CEAA, that has been established by Fisheries and Oceans Canada and that will be maintained by the Agency until the submission of the Panel report.

"Responsible Authority" refers to such an authority as defined in the *Canadian Environmental Assessment Act*.

2. Establishment of the Panel

2.1. A process is hereby established to create a Joint Panel, pursuant to section 22 of the *Energy Resources Conservation Act* with the authorization of the Lieutenant Governor in Council of Alberta, and Sections 40, 41 and 42 of the *Canadian Environmental Assessment Act*, for the purposes of the review of the Project.

2.2. The ERCB and the Agency will make arrangements to coordinate the announcements of a joint review of the Project by both Alberta and Canada.

3. Constitution of the Panel

3.1. The Joint Panel will consist of three members. Two members, including the Joint Panel Chair, will be appointed by the Chair of the ERCB with the approval of the Federal Minister of the Environment. The third Joint Panel member will be appointed by the Federal Minister of the Environment in accordance with article 3.2 of this Agreement.

3.2. The Federal Minister of the Environment will select the third Joint Panel member and recommend the selected candidate as an individual who may serve as a potential acting member of the ERCB. If acceptable to the Lieutenant Governor in Council of Alberta and the

Chairman of the ERCB, the Lieutenant Governor in Council of Alberta will nominate this candidate to serve as an acting member of the ERCB and the Chairman of the ERCB will appoint this candidate as a member of the Joint Panel. The selected candidate will then be appointed by the Federal Minister of the Environment as a member of the Joint Panel.

3.3. The Joint Panel members shall be unbiased and free from any conflict of interest relative to the Project and are to have knowledge or experience relevant to the anticipated environmental effects of the Project.

4. Conduct of Assessment by the Panel

4.1. The Joint Panel shall conduct its review in a manner that discharges the responsibilities of the ERCB under the *Energy Resources Conservation Act*.

4.2. The Joint Panel shall conduct its review in a manner that discharges the requirements set out in the *Canadian Environmental Assessment Act* and in the Terms of Reference attached as an Appendix to this Agreement and that were fixed and approved by the Federal Minister of the Environment and the ERCB.

4.3. The Joint Panel hearing shall be public and the review will provide opportunities for timely and meaningful public participation.

4.4. The Joint Panel shall have all the powers and duties of a panel described in Section 35 of the *Canadian Environmental Assessment Act* and of a division of the ERCB described in Section 8 of the *Energy Resources Conservation Board Act*.

4.5. The Joint Panel shall conduct its public hearing in accordance with the ERCB Rules of Practice.

4.6 A majority of the Joint Panel members constitutes a quorum for the purposes of the environmental assessment to be conducted by the Joint Panel. When a hearing, public meeting, or other activity is conducted by the Joint Panel and a member of the Joint Panel for any reason does not attend on any day or part of a day, the other member or members who are sitting at the hearing, public meeting or other activity, if they constitute a quorum, may continue as fully and effectively as though the absent member or members were present.

5. Secretariat

5.1. Administrative, technical, and procedural support requested by the Joint Panel shall be provided by a Secretariat, which shall be the joint responsibility of the ERCB and the Agency.

5.2. The Secretariat will report to the Joint Panel and will be structured so as to allow the Joint Panel to conduct its review in an efficient and cost-effective manner.

5.3. The ERCB will provide its offices for the conduct of the activities of the Joint Panel and the Secretariat.

6. Record of Joint Review and Report

6.1. A public registry will be maintained by the Secretariat during the course of the review in a manner that provides for convenient public access, and for the purposes of compliance with section 55 and 55.4 of the *Canadian Environmental Assessment Act*.

6.2 Subject to subsections 35(4), and 35(4.1) and section 55.1,of the *Canadian Environmental Assessment Act*, the public registry will include all submissions, correspondence, hearing transcripts, exhibits and other information received by the Joint Panel and all public information produced by the Joint Panel relating to the review of the Project.

6.3 The responsible authority under the *Canadian Environmental Assessment Act* will make necessary arrangements with the Agency for the maintenance of the public registry, when the Joint Panel is announced. The registry will be maintained by the Agency during the course of the joint panel review in a manner that provides for convenient public access, and for the purposes of compliance with section 55 to 55.5 of *Canadian Environmental Assessment Act*.

6.4. On completion of the assessment of the Project, the Joint Panel will prepare a Report. The Report will be conveyed to the Government of Alberta and the Federal Minister of the Environment within ninety days of the close of hearing. Simultaneously, the Report will be published and made available to the public by the Joint Panel.

6.6. After the Report is submitted, the responsibility for the maintenance of the public registry will be transferred to the responsible authority. The ERCB will continue to maintain records of the proceedings and the Report, as per the ERCB Rules of Practice.

6.7. The Agency will be responsible for the translation of key documents prepared by the Joint Panel, including public notifications and releases and the Report, into both of the official languages of Canada. The Agency will use all reasonable efforts to expedite the translation of the Report.

7. Other Government Departments

7.1. The Joint Panel may request federal authorities and provincial authorities having specialist information or knowledge with respect to the Project to make that information or knowledge available to the Joint Panel in an acceptable manner.

7.2. Nothing in this Agreement will restrict the participation by way of submission to the Joint Panel by other federal or provincial government departments or bodies, subject to article 7.1, above, section 12(3) of the *Canadian Environmental Assessment Act* and the ERCB Rules of Practice.

8. Participant Funding

8.1. Decisions regarding participant funding by the Agency under the federal Participant Funding Program, and decisions on intervener funding by the ERCB as provided for in the *Energy Resources Conservation Act*, ERCB Rules of Practice and the ERCB

Guidelines for Energy Cost Claims (Guide 31A) will, to the extent practicable, take into account decisions of the other party.

9. Cost Sharing

9.1. The ERCB, as lead party, will develop a budget estimate of expenses agreeable to both parties prior to initiation of the Joint Panel activities.

9.2. The costs of the review will be apportioned between the ERCB and the Agency in the manner set out in articles 9.3, 9.4 and 9.5.

9.3. The ERCB will be solely responsible for the following costs:

- salaries and benefits of the Joint Panel Chairman and the member of the Joint Panel not appointed in accordance with article 3.2; and
- salaries and benefits of ERCB staff involved in the joint review.

9.4. The Agency will be solely responsible for the following costs:

- per diems of the Joint Panel member appointed in accordance with article 3.2;
- salaries and benefits of Agency staff involved in the joint review;
- all costs associated with the federal Participant Funding Program;
- translation of records and documents into the official languages of Canada other than translation required as outlined in section 9.5 of this Agreement; and
- costs associated with the public registry established pursuant to section 55.1 of the CEAA.

9.5. The ERCB and the Agency agree to share equally all those costs listed below, incurred as part of the joint review from the signing of this Agreement to the date the Report is issued by the Joint Panel. The shareable costs are as follow:

- travel-related expenses associated with the review incurred by Joint Panel members and Panel Secretariat staff;
- per diems and associated expenses of independent/non-government expert consultants, analysts and communications specialists retained by the Secretariat;
- language translation and interpretation services and facilities related to the evidence of applicants, participants and local interveners as required by the joint panel, but not including translation service referred to in Section 6.7 of this Agreement;
- printing of any reports and documents distributed by the Joint Panel necessary for the Panel's work;
- the publication of notices and releases;
- photocopying, including the reproduction of documents contained in the public registry, and postage related to the review;
- court reporting and transcripts as required by the Joint Panel;

- rental of hearing, public meeting and public information office facilities and equipment;
- audio and audio-visual services at the hearing and public meetings; and
- miscellaneous expenditures up to a maximum of five percent (5%) of the total budget for the review.

9.6. The Agency may only be responsible for contributing to shareable costs within the allowable limits of Treasury Board Secretariat directives.

9.7. Shareable costs of the joint review as detailed in article 9.5 will be incurred at the sole discretion of the Joint Panel with due regard to economy and efficiency.

9.8. All expenses not listed above will need prior approval of both parties if they are to be equally shared.

10.0 Invoicing

10.1 The ERCB will be responsible for advancing funds for the payment of the shareable costs and will invoice the Agency for the amounts owed under this Agreement, except for travel-related expenses of the Agency's staff which will be advanced by the Agency. In the event that the Agency is required to advance shareable funds directly, it will advance funds for payment and will invoice the ERCB as determined under this Agreement.

10.2 The invoicing will be done either at the end of each month or quarterly at the discretion of the ERCB. The invoice will cover all shareable costs paid by the ERCB.

10.3 Each invoice will be accompanied by a summary description of the shareable costs actually incurred and paid for the period covered by the invoice, in a form satisfactory to both Parties and will be approved by an official acceptable to both Parties. Detailed information about incurred costs will be retained and made available to either Party upon request.

10.4 Subject to compliance with the above requirements the Agency will pay to the ERCB the amount stated as being owed to it in the invoice within sixty (60) days of having received such invoice.

10.5 With respect to invoices covering the last period of any fiscal year (ending March 31), and the last invoice to be produced for the joint review panel, each Party may review and deduct from the invoice, any incurred shareable costs that have not been previously recovered, so as to determine a net transfer of shared costs from one Party to another. The payment will be made within thirty (30) days of having received such invoice. An accounting of the shared expenses incurred by the Agency will be sent with the year-end and final payments, or earlier as may be requested by the ERCB.

11.0 Audit

11.1 Subject to this Agreement, both Parties will keep open to audit and inspection by the Agency or the ERCB, or their duly authorized representative, all invoices, receipts, vouchers and documents of any nature or kind whatsoever that have been relied on by either of the two Parties to calculate the shared cost of conducting the public review.

11.2 The Party exercising its option to audit will be responsible for the cost of the audit.

11.3 Where an audit conducted by either Party in connection with this Agreement reveals discrepancies regarding the amount billed to the Agency, and where prompt resolution between the Parties is unattainable, an independent auditor acceptable to both Parties will resolve the issue.

12. Amending this Agreement

12.1. The terms and provisions of this Agreement may be amended by written memorandum executed by both the Federal Minister of the Environment and the Chairman of the ERCB. Subject to section 27 of the *Canadian Environmental Assessment Act*, upon completion of the joint review, this Agreement may be terminated at any time by an exchange of letters signed by both parties.

13. Signatures

WHEREAS the parties hereto have put their signatures

Original signed by Original signed by

The Honourable John Baird Minister of the Environment	Dan McFadyen, P.Eng. Chairman Energy Resources Conservation Board
June 14, 2008 Date	*July 30, 2008* Date

Appendix Terms of Reference

Part I - Scope of Project

The Joslyn North Mine Project proposed by TOTAL E&P Canada Ltd. includes the construction, operation, and reclamation of an oil sands surface mine and bitumen extraction facilities in the Fort McMurray area. The proposed mining project is to be located approximately 70 kilometres north of Fort McMurray on Oil Sands Leases. The proposed development includes an open pit, truck and shovel mine, ore handling facility, bitumen extraction facilities, tailings processing facilities, support infrastructure, water and tailings management plans, and an integrated reclamation plan. The Joslyn North Mine project is designed to produce a total of 15,900 cubic metres per day (100,000 barrels per day) of bitumen.

The project components which are part of the scope of this assessment include:

- Open pit, truck and shovel mine;
- Ore preparation and handling facility;
- Bitumen extraction facilities;
- Bitumen froth treatment plan;
- Bitumen products storage facilities;
- Tailings management and processing facilities;
- Joslyn Creek diversion and associated required infrastructures;
- Fish habitat compensation and any required infrastructures;
- Co-generation facility;
- All related works and activities including all temporary facilities required for the construction and operation of the above-mentioned facilities, namely
    - permanent and temporary access roads (new or modified);
    - construction or modification of any airstrip);
    - permanent and temporary work camps;
    - all temporary or permanent electrical power supply lines;
    - drinking water supply for camps;
    - water supply for the project, including water storage facilities
    - all temporary or permanent power supply for camps and worksites;
    - temporary control structures and diversion works;
    - treatment of wastewaters and waste management as well as the infrastructure required for this management;
    - any bridges and watercourse crossings (new or modified);
    - borrow pits and quarries;
    - construction worksites and storage areas;
    - management of excavation material;
    - handling and storage of petroleum products and hazardous materials

Part II - Scope of the Environmental Assessment

1. The Joint Panel will conduct an assessment of the Environmental Effects of the Project based on the Scope of Project (Part I).
2. The assessment will include a consideration of the factors listed in subsection 16(1)(a) to (d) and 16(2) of the *Canadian Environmental Assessment Act*, namely:
    a. the environmental effects of the Project, including the environmental effects of malfunctions or accidents that may occur in connection with the Project and any cumulative environmental effects that are likely to result from the Project in combination with other projects or activities that have been or will be carried out;
    b. the significance of the effects referred to in paragraph a);
    c. comments from the public including First Nations, Métis and aboriginal persons that are received during the review;
    d. measures that are technically and economically feasible and that would mitigate any significant adverse environmental effects of the Project;
    e. the purpose of the Project;
    f. alternative means of carrying out the Project that are technically and economically feasible and the environmental effects of any such alternative means;
    g. the need for, and the requirements of, any follow-up program in respect of the Project; and
    h. the capacity of renewable resources that are likely to be significantly affected by the Project to meet the needs of the present and those of the future.
3. Pursuant to subsection 16(1)(e) of the *Canadian Environmental Assessment Act*, the assessment by the Joint Panel will also include a consideration of the additional following matters:
    a. the need for the Project; and
    b. alternatives to the Project received during the review;
4. Pursuant to subsection 16.1 of the *Canadian Environmental Assessment Act*, the assessment by the Joint Panel may also include a consideration of the community knowledge and aboriginal traditional knowledge received during the review.

Part III – Scope of the factors

The Panel should consider the factors specified in the "Final Terms of Reference" for the preparation of the Environmental Impact Assessment Report for the Joslyn North Mine Project issued by Alberta Environment on September 29, 2005. The document is available on the Public Registry (document # 6).

In addition in accordance with section 16(3) of the *Canadian Environmental Assessment Act*, the Panel in conducting its consideration of the factors outlined in Part II should have regard for the following:

Cumulative Effects Assessment

The Panel shall identify and assess the project's cumulative effects. Cumulative effects are those changes to the environment due to the project combined with the existence of other works or other past, present and reasonably foreseeable future projects.

The cumulative effects assessment should take into consideration the approach described in the Canadian Environmental Assessment Agency's *Cumulative Effects Assessment Practitioners Guide* (1999) and in the Agency's Operation Policy Statement entitled "Addressing Cumulative Environmental Effects under the *Canadian Environmental Assessment Act*" updated in November 2007.

The Panel should focus its consideration of cumulative effects on key valued environmental components. Without limiting itself thereto, the following components may be considered:

- Water quality and quantity;
- Air quality;
- Current use of lands and resources for traditional purposes by aboriginal persons;
- Wildlife and wildlife habitat for key species;

Accidents & Malfunctions

The environmental assessment will consider the probability of potential accidents and malfunctions related to the project, including the potential consequences and environmental effects related to such events.

Potential accidents and malfunctions may include those associated with the following components:

- tailings management;
- waste management and disposal;
- use, handling or spills of chemicals and hazardous materials on-site;
- the increase in road traffic, and the risk of road accidents; and
- any other project components or systems that have the potential, through accident or malfunction, to adversely affect the natural environment.

The environmental assessment should consider the sensitive elements of the environment (e.g., communities, homes, natural sites of interest, areas of major use) that may be affected in the event of an accident or a major malfunction. The environmental assessment should consider the likelihood of occurrence of the accidents and malfunctions.

Detailed plans, measures and systems to reduce the potential occurrence of an accident or malfunction should be considered in the assessment and should indicate how they will reduce the effects or consequences of an accident or malfunction.

Effects of changes to the environment

To take into account the "environmental effects" defined by the *Canadian Environmental Assessment Act*, the environmental assessment will consider the effects of any changes to the environment caused by the project on the following factors:

- *Health and Socio-Economic Conditions*
- *Physical and Cultural Heritage*
- *Current use of lands and resources for traditional purposes by aboriginal persons*
- *Any structure, site or thing that is of historical, archaeological or architectural significance*

Change to the project caused by the environment

The environmental effects that may occur as a result of the environment acting on the Project should be assessed.

Environmental changes and hazards that may occur and may affect the Project shall be described (e.g., severe precipitation events, flooding, earthquakes). The assessment should take into account the potential influence of climate change scenarios (e.g., increased severity and frequency of storms and flooding). The influence that these environmental changes and hazards may have on the Project should be predicted and described.

Renewable Resources

The environmental assessment should consider whether the Project is likely to cause significant environmental effects on renewable resources and therefore compromise their capacity to meet present and future needs.

The environmental assessment should describe the renewable resources that may be affected by the Project and it shall clearly establish, taking into account the result of the assessment, whether these renewable resources are likely to be significantly affected following the implementation of proposed mitigation measures (residual significant environmental effects). Should this be the case, the following points should be addressed:

- a brief description of the Project's environmental effects on the renewable resource;
- an indication as to the way in which the capacity of this resource was measured or evaluated;
- an indication of the temporal and geographic boundaries used to assess the capacity of the affected resource;
- a determination of the capacity of the resource to meet current needs;
- a determination of the capacity of the resource to meet future needs;
- a description of any other appropriate mitigation measures;
- a determination of the significance of the residual effects on the renewable resource and its capacity to meet the need of current and future generations;
- an identification of the risks and uncertainties that remain and the description of the next steps, if any, that will be required to address this effect.

Part IV – Review Process

The main steps of the joint review by the Panel will be as follows:

Review of the documentation

1. Once appointed, the Joint Panel will review the information available on the public registry and comments received from the public and determine whether the information available is sufficient to proceed to the public hearing phase of the process.
2. Should the Joint Panel identify deficiencies after reviewing the available information, the Joint Panel may require additional information from the Proponent. Any request for additional information shall be issued by the Joint Panel within 45 days of its appointment.
3. If the Joint Panel concludes that it has adequate information to proceed to hearing, it shall announce the hearing providing a minimum of 60 days prior to the commencement of the hearing.

Determination of Adequacy of Additional Information (if requested)

4. Upon receipt of the additional information, the Joint Panel will ensure that it is made available to the public for review and comment.
5. If after reviewing the additional information and any written comments from interested parties the Joint Panel concludes that it has adequate information to proceed to hearing, it shall announce the hearing within 45 days of receipt of the additional information, providing a minimum of 60 days prior to the commencement of the hearing.
6. If after reviewing the additional information and written comments from interested parties the Joint Panel is still of the view that it does not have adequate information to proceed to hearing, it shall inform the Proponent of outstanding information requirements, and indicate that the hearings will not be scheduled until that information is submitted.
7. If after reviewing the additional information and written submissions from interested parties the Joint Panel is of the view that the lack of information is minor in nature and the Joint Panel receives a commitment from the Proponent to provide the outstanding information prior to the hearing, the Joint Panel may proceed to hearings within 45 days of receipt of the response to the first request for additional information.

Public Hearings

8. The Joint Panel will hold hearing in locations determined by the Joint Panel and will endeavour to hold at least a portion of the hearing within the area likely to be affected by the Project, or in any area reasonably close to where the Project is proposed to be carried out, to provide convenient access for the potentially affected public.

Panel Report

9. The Joint Panel will deliver its report to the Federal Minister of the Environment within 90 days following the close of the hearing. The report will take into account and reflect the views of all Panel members.

MEMORANDUM

Amendment to the Agreement To Establish a Joint Panel for the Joslyn North Mine Project

Between
The Minister of the Environment, Canada
- and -
The Energy Resources Conservation Board, Alberta

The agreement to establish a Joint Panel for the Joslyn North Mine Project (the Agreement) shall be amended pursuant to section 12 of the Agreement. The amendment allows the Joint Panel discretion to set the timeline for reviewing the additional information and public comments by revising the reference to the 45 day timeline to complete this task.

Sections 4 and 5 of Part IV of the Appendix of the Agreement currently read:

4. Upon receipt of the additional information, the Joint Panel will ensure that it is made available to the public for review and comment.

5. If after reviewing the additional information and any written comments from interested parties the Joint Panel concludes that it has adequate information to proceed to hearing, it shall announce the hearing within 45 days of receipt of the additional information, providing a minimum of 60 days prior to the commencement of the hearing.

Sections 4 and 5 of Part IV of the Appendix of the Agreement are hereby amended to read as follows

4. Within 15 working days following receipt of the additional information, the Joint Panel will:
   a. announce the period of time necessary for the review of the additional information, and
   b. ensure that the additional information is made available to the public for review and comment.

5. If after reviewing the additional information and any written comments from interested parties the Joint Panel concludes that it has adequate information to proceed to hearing, it shall announce the hearing before the expiry of the period of time necessary for the review of the additional information, providing a minimum of 60 days prior to the commencement of the hearing.

'Original signed by'

The Honourable Jim Prentice
Minister of the Environment

Date

'Original signed by'

Dan McFadyen, Chairman
Energy Resources Conservation Board

Date

APPENDIX 3 – LIST OF CONDITIONS

Condition 1 – TOTAL will submit a detailed tailings management plan two years before commencement of operations, and TOTAL will clearly demonstrate its ability to meet all requirements of *Directive 074*. (Section 5.1.3)

Condition 2 – TOTAL will devise methods for measuring fines at the project in accordance with Energy Resources Conservation Board requirements. (Section 5.1.3)

Condition 3 – TOTAL will notify the Energy Resources Conservation Board in writing of any proposed pilot plants and/or demonstration plants for all technology development at least six months before construction of those facilities begins. (Section 5.1.3)

Condition 4 – TOTAL will provide written updates of any previously submitted test reports by no later than February 28 each year, or as otherwise specified by the Energy Resources Conservation Board. (Section 5.1.3)

Condition 5 – TOTAL will not exceed three million cubic metres of fluid in the sand beach area sumps. (Section 5.1.3)

Condition 6 – One year prior to plant start-up, TOTAL will provide measurement plans to the Energy Resources Conservation Board for review and approval, including process and instrumentation diagrams, metering, sampling methods, analytical methods and, material balance procedures that satisfy Energy Resources Conservation Board measurement requirements. (Section 5.2.2)

Condition 7 – TOTAL will not discharge any untreated froth treatment tailings to the tailings disposal area. (Section 5.3.2)

Condition 8 – On an annual average basis, TOTAL will limit site-wide solvent losses to not more than four volumes per thousand volumes of bitumen production under any operating conditions. (Section 5.3.2)

Condition 9 – On an annual average basis, TOTAL will limit the amount of asphaltene rejection to 10 mass per cent based on bitumen production. (Section 5.4.2)

Condition 10 – TOTAL will submit detailed geotechnical designs for all external overburden disposal areas and reclamation stockpiles to the Energy Resources Conservation Board at least six months prior to conducting any field preparation in these areas. (Section 5.5.3)

Condition 11 – TOTAL will submit to the Energy Resources Conservation Board, for its review and approval, detailed geotechnical designs and setback distances for critical infrastructure two years prior to site preparation activities for the ore preparation plant pit, the west and southern final pitwall, and for the final pitwall design and assessed setback from the Ells River. (Section 5.5.3)

Condition 12 – TOTAL will provide Alberta Environment with a wildlife mitigation plan for approval prior to clearing any vegetation. The plan must achieve no net significant adverse effect on species at risk and deal with mitigating impacts to not only species at risk, but also valued wildlife. (Section 6.1.3)

Condition 13 – TOTAL will monitor noise levels at James Grandejambe's cabin. Should noise levels exceed those outlined in *Directive 038*, TOTAL will ensure that mitigation measures are implemented and that *Directive 038* compliance is met. (Section 9.6.3)

Condition 14 – TOTAL will maintain unimpeded access required for stakeholders to areas west of the project until the Moose Lake access management plan, or an equivalent, is implemented. (Section 9.7.3)

Condition 15 – TOTAL will actively support and participate in the Cumulative Environmental Management Association and other regional committees to develop and use its strategies to mitigate both development and regional cumulative environmental effects. (Section 10.1.3)

Condition 16 – TOTAL will limit the area of disturbance to 5000 hectares or less. (Section 10.1.3)

Condition 17 – TOTAL will remove all benching on mine discard structures prior to reclaiming them. (Section 10.1.3)

Condition 18 – TOTAL will provide sustainable watershed designs with vegetated watercourses for geotechnical design applications for mine discard structures. Landform watershed designs should be consistent with regionally recognized guidelines for the purpose of erosion management. (Section 10.1.3)

Condition 19 – TOTAL will provide an amended mine plan to demonstrate an integrated landform and landscape design for the Canadian Natural Resources Limited – TOTAL common mine boundary to the Energy Resources Conservation Board for approval five years prior to development. The amended plan must include a discussion of the feasibility of filling the trench area between the Joslyn North and Horizon projects with mine discard. The plan must also include a discussion of the alternatives considered by TOTAL. (Section 10.2.3)

Condition 20 – TOTAL will submit an annual report to the Energy Resources Conservation Board, starting two years prior to commencing mining operations, that describes its end pit lake research and development efforts for the previous year, and the current plans and timelines for determining the efficacy of its end pit lake within seven years of mine closure. This report will include all of TOTAL's efforts and contributions with respect to collaboration on the demonstration of a full scale end pit lake. (Section 12.3)

APPENDIX 4 – LIST OF RECOMMENDATIONS

Recommendation 1 — The Panel recommends that prior to any authorization of the project, Alberta Sustainable Resource Development consult with Environment Canada as appropriate, and work with TOTAL to ensure that additional mitigation, such as using off-site offsets, avoiding high quality habitat, and conducting research, be identified to ensure that the project would not cause significant adverse effects on species at risk. The new wildlife mitigation plan should not only deal with mitigating impacts on species at risk and valued wildlife, but should also reduce the overall cumulative effects to wildlife. These additional measures should be provided to Alberta Environment for inclusion in any *Environmental Protection and Enhancement Act* approval it may issue. (Section 6.1.3)

Recommendation 2 — The Panel recommends that the Energy Resources Conservation Board and Alberta Sustainable Resource Development cooperate to provide an assessment of the implications of resource sterilization to help Alberta Sustainable Resource Development in determining the most appropriate setback of the project from the Ells River. (Section 6.1.3)

Recommendation 3 — The Panel recommends that the Energy Resources Conservation Board and Alberta Sustainable Resource Development, in consultation with Environment Canada as appropriate, determine the appropriate mine development setbacks from the Athabasca River and the crest of the Ells River valley to ensure effective wildlife corridors and provide these setbacks to Alberta Environment to include in any *Environmental Protection and Enhancement Act* approval it may issue. (Section 6.1.3)

Recommendation 4 — The Panel recommends that Alberta Environment and Alberta Sustainable Resource Development, with advice from Environment Canada as appropriate, determine what combination of monitoring and follow-up measures TOTAL or the Cumulative Environmental Management Association should conduct and, based on the results of such work, implement such adaptive management measures as are necessary. (Section 6.1.3)

Recommendation 5 — The Panel recommends that, before the project begins, TOTAL develop and submit a detailed plan to Alberta Environment, in consultation with Environment Canada as appropriate, and to Alberta Sustainable Resource Development for review and approval, outlining its explicit plans to experiment with peat land and reclaim wetland. Alberta Environment should also require that TOTAL develop a follow-up and monitoring program in consultation with Alberta Sustainable Resource Development and Environment Canada, as appropriate, to determine the success of reclaimed wetlands. (Section 6.2.3)

Recommendation 6 — The Panel recommends that the federal and provincial governments work with the Canadian Council of Ministers of the Environment to develop specific water quality objectives for naphthenic acids. (Section 6.3.2.3)

Recommendation 7 — The Panel recommends to the Government of Alberta that it develop appropriate *Environmental Protection and Enhancement Act* approval requirements to address continuous benzene monitoring for compliance with the objectives. (Section 6.5.3)

Recommendation 8 — As changes to current source emission standards are reasonably foreseeable, the Panel recommends that TOTAL as well as proponents of new or expanding oil sands projects incorporate flexibility into their projects so that they can achieve compliance with future standards within a reasonable timeframe. (Section 6.5.3)

Recommendation 9 — The Panel recommends that Alberta Sustainable Resource Development use the Lower Athabasca Regional Plan process to protect key habitats for species at risk and to provide source habitat for species recolonization in the oil sands area. (Section 7.2.3)

Recommendation 10 — The Panel recommends that recommendations made by the Cumulative Environmental Management Association in the Terrestrial Ecosystem Management Framework be considered by the Government of Alberta for inclusion in the Lower Athabasca Regional Plan. (Section 7.2.3)

Recommendation 11 — The Panel recommends that SRD require that forest harvesting within the regional study area be done outside of the migratory bird breeding season (i.e., from April 1 to August 31). (Section 7.2.3)

Recommendation 12 — The Panel recommends that the Government of Alberta continue to work with the Regional Municipality of Wood Buffalo to ensure that the supply of land for residential development and the necessary planning are in place to meet the existing and expected housing demand in the region. (Section 9.3.2)

Recommendation 13 — The Panel recommends that Alberta Sustainable Resource Development complete the Moose Lake access management plan to provide uninterrupted public access to areas traditionally used west of the proposed project. (Section 9.7.3)

Recommendation 14 — The Panel recommends that Alberta Environment establish measurable targets for increased indigenous vegetative biodiversity in the reclaimed landscape and the postclosure landscape. (Section 10.1.3)

Recommendation 15 — The Panel recommends that Alberta Environment, Alberta Sustainable Resource Development and the Energy Resources Conservation Board work collaboratively to establish direction and standards required for interlease oil sands mine watershed and landform design coordination. The initiative should address legislation and/or regulation requirements and consider recommendations of the Fort McMurray-Athabasca Oil Sands Subregional Integrated Resource Plan, the End Land Use Committee Recommendations, the Regional Sustainable Development Strategy, and any other requirement that may be established by Alberta to guide oil sands mine development on public lands. (Section 10.2.3)

Recommendation 16 — The Panel recommends that Alberta Environment include water quality management conditions in any *Environmental Protection and Enhancement Act* approval it may issue, to specifically address water quality concerns and ensure that the water in TOTAL's end pit lake meets release quality criteria at closure. (Section 12.3)

Recommendation 17 — The Panel recommends that Alberta Environment include the following requirements in any *Environmental Protection and Enhancement Act* approval that it may issue for TOTAL to:

- provide functional plans to monitor end pit lake water quality and assess treatment options that TOTAL would implement to meet end pit lake water release criteria within seven years of mine closure;
- provide functional plans to ensure that the volume of process-affected water and porewater in the end pit lake does not exceed 15 million cubic metres, and
- refine, update, and validate the models used for predicting water quality in the end pit lake based on characterization of the process-affected water that TOTAL plans to transfer into the lake. (Section 12.3)

APPENDIX 5 – SUMMARY OF COMMITMENTS

The Panel notes throughout the report that TOTAL has undertaken to conduct certain activities in connection with operations that are not strictly required by the ERCB, AENV or by DFO regulations or guidelines. These undertakings are described as commitments.

The Panel believes that when a company makes commitments of this nature, it has satisfied itself that these activities would benefit the project, the stakeholders, and the public, and the Panel takes these commitments into account when arriving at its decision. The Panel expects that TOTAL would adhere to all commitments it made during the consultation process, in the application, and at the hearing to the extent that those commitments do not conflict with the terms of any approval or licence affecting the project or any law, regulation, or similar requirement that TOTAL is bound to observe. The Panel expects TOTAL to advise the ERCB if, for whatever reasons, it cannot fulfill a commitment. The ERCB would then assess whether the circumstances regarding the failed commitment warrant a review of the original approval. The Panel also notes that the affected parties also have the right to request a review of the original approval if commitments made by the applicant remain unfulfilled.

Commitments

DESIGN

1. TOTAL will use low-NO_x (oxides of nitrogen) technology for boilers and cogeneration units that will result in NO_x emission concentrations better than the compliance limits in the current Interim AENV NO_x Guidelines.

2. There will be no continuous operational flaring. A vapour recovery unit will be used to capture process off-gas, thereby limiting the volume of gas flared by the project. Vessels and process units associated with the storage and use of solvent will also be equipped with vapour recovery systems.

3. Solvent levels in the tailings stream and at the pond surfaces will be monitored. Untreated froth treatment tailings will not be released to the pond.

4. The solvent recovery system will be designed and operated to ensure that solvent losses from froth treatment tailings will be below an annual average of four volumes per 1000 volumes of bitumen production.

5. The extraction plant will be designed to accommodate potential future installation of carbon capture facilities.

6. TOTAL will have an off-stream storage pond with a 90-day storage capacity which will enable reduced or zero withdrawal during low flow conditions in winter.

7. Representatives of Fort McKay First Nation, Athabasca Chipewyan First Nation and Mikisew Cree First Nation will continue to be engaged during the development and finalization of the No Net Loss Plan.

8. The mine pit crest will be set back a minimum of 100m from the 100-year flood high water level of the Ells River.

CONSTRUCTION

9. The on-site worker orientation program will include a briefing on identification and management of palaeontological and historical artifacts.

10. During construction, transportation of heavy or oversized loads will be required. In order to minimize disruption, TOTAL will consult with affected stakeholders to determine the most appropriate time for such traffic. TOTAL will work closely with Alberta Infrastructure and Transportation and neighbouring developers to coordinate transportation of loads. TOTAL will also consult with Canadian Natural Resources Limited (CNRL), the Regional Municipality of Wood Buffalo and appropriate government authorities to develop reasonable improvements for traffic safety for the Highway 63-CNRL interchange.

OPERATIONS

11. Beaver dams will not be removed unless they exist in areas being diverted.

12. TOTAL will ensure that there will be employee training and dedication of resources to onsite wild life management.

13. TOTAL will prohibit employees and camp residents from accessing natural areas outside of the project operations area for hunting, fishing or other recreational purposes during employment hours or while resident in camp. It will prohibit camp residents from bringing recreational vehicles (e.g. ATV's, snow mobiles), firearms, hunting or fishing gear onto the project site. Furthermore, companion pets will be disallowed.

14. Brushing and other vegetation management measures along road shoulders will be designed to provide sufficient field of vision to react to wildlife on or entering the roadway and eliminate attractive wildlife forage close to the road edge.

15. TOTAL will promote the use of bus transport to the work site to minimize single vehicle trips.

CLOSURE AND RECLAMATION

16. Access to the pit lake for fishing or other recreational activities will be restricted. Public access will only be available when fish and water concentrations meet appropriate regulatory guidelines.

17. First Nations will be consulted on reclamation to provide a range of ecosite phases that support a variety of traditional plants and land uses. First Nations will be consulted throughout the life of the mine to incorporate traditional land use needs into progressive reclamation and final closure planning.

18. TOTAL plans to incorporate and re-establish Jack pine stands in the reclaimed landscape.

19. Topsoil will be direct-placed whenever possible as part of the reclamation program.

MANAGEMENT AND MONITORING

20. TOTAL will work with local stakeholders to develop an odour notification protocol and will work with stakeholders and WBEA to ensure the appropriate level of monitoring is in place to track potential odour events.

21. TOTAL will implement a methane emissions monitoring and measurement program to quantity methane emissions related to mine face and tailings pond.

22. TOTAL plans to participate in Alberta Health Services (Northern Lights Regional Health Authority) initiatives to monitor human health in the region.

REGIONAL INITIATIVES

23. TOTAL will participate in the following regional oil sands multi-stakeholder committees and collaborative industry initiatives:

- Alberta Biodiversity Monitoring Program (ABMI) and the Regional Terrestrial Monitoring Program
- Cumulative Environmental Management Association (CEMA)
- Canadian Oilsands Network for Research and Development (CONRAD)
- Oil Sands Developers Group (OSDG)

STAKEHOLDERS

24. TOTAL will continue to provide access for aboriginal communities to undeveloped areas west of the project development area on the Joslyn Lease, including the Moose Lake Trail, for traditional land use activities such as hunting, fishing, berry picking, and gathering of plants.

25. TOTAL will work with present and future aggregate developers to mitigate the impacts on sand and gravel exploration and development to ensure any commercial resource is identified and extracted with minimal conflict with the project.

26. Metallic and industrial mineral (MIM) leaseholders will be consulted to identity and develop a strategy for developing commercial mineral resources that might be affected by the project.

27. TOTAL is working with the Wood Buffalo Chamber of Commerce and the Northeastem Alberta Aboriginal Business Association and their Regional Economic Development (RED) Link program to facilitate the use of local companies.

28. TOTAL will continue to work on regional training initiatives that provide skill development for Aboriginal and local candidates to participate in long term employment opportunities. TOTAL also anticipates providing apprenticeship opportunities, such as the Alberta Aboriginal Apprenticeship Program during mine operations.

29. TOTAL will work closely with Northeastern Alberta Aboriginal Business Association, Fort Mc Murray Chamber of Commerce and directly with the communities to better understand current capacity and gaps in skill sets required for aboriginal business participation in contracting and business opportunities. Where TOTAL identifies resources or expertise gaps that it can reasonably assist in resolving, then TOTAL intends to provide support to small businesses to increase capacity.

30. TOTAL is committed to implementing local and aboriginal business guidelines.

31. TOTAL will consult directly with trappers affected by its resource development activities. TOTAL will consult with the IRC to ensure impacts to the trappers are considered and reasonably addressed.

COMMITMENTS MADE DURING THE HEARING

32. TOTAL will acquire partial terrestrial conservation offsets within the Boreal Forest Natural Region in the Athabasca River watershed. *(Transcript Volume* 2, *p.* 344 *and 345)*

33. TOTAL will thoroughly review ail regulatory authorizations and permits that are issued for the Joslyn North Mine Project. As part of the project management system, TOTAL will ensure that the project is in compliance with these authorizations and permits during all stages of the project *(Transcript Volume* 4, *p. 986).*

34. TOTAL will implement active water treatment if the pit lake water quality does not meet discharge standards at the time of planned release *(Transcript Volume* 4, *p. 1103).* Potential treatment options are discussed in the response to 2010 AI Project Update JRP AIR II , p. 40.

35. TOTAL commits to no water withdrawals from the Athabasca River during low flow conditions in compliance with the Athabasca River Water Management Framework *(Transcript Volume 4, p. 11 /4 and 1115).*

RECOMMENDATIONS FROM THE GOVERNMENT OF CANADA

DFO

36. TOTAL will finalize and implement the detailed No Net Loss Plan that will provide, at minimum, a 2:1 ratio of fish habitat compensation based on Habitat Units.

37. Once all the necessary River Water [intake details have been compiled, TOTAL will develop, finalize and implement, in consultation with DFO, a plan to compensate for potential impacts to fish habitat associated with the River Water Intake.

38. TOTAL will continue to support the collection of data related to traditional use of lands and resources in the Ells River Watershed.

39. TOTAL will develop and implement a monitoring program, to the satisfaction of DFO, aimed at validating models and verifying predictions related to quality and quantity of fish habitat in the predisturbance habitat and the proposed fish habitat compensation structures, and that addresses the uncertainties associated with modeling the productive capacity of fish habitat compensation.

40. TOTAL will develop and implement a monitoring program, to the satisfaction of DFO, that will verify compliance with commitments expressed in the No Net Loss Plan and ail conditions of any authorization provided by DFO.

41. TOTAL supports the development of a water management framework that will be implemented with ongoing review so that the monitoring, which improves the understanding of the effects of water withdrawals, can be incorporated in a system that will protect the fish and fish habitat of the lower Athabasca River.

42. TOTAL will support the development and participate in the implementation of a monitoring program focusing on cumulative effects assessment of water withdrawals.

43. TOTAL will continue to support the collection of data relating to traditional use of lands and resources of the lower Athabasca River.

44. TOTAL will ensure the water intake design does not require a minimum diversion.

45. TOTAL will adhere to the intentions of the Water Management Framework and all adaptive management that may result from the findings of future monitoring.

46. TOTAL will, in collaboration with regional stakeholders, (including aboriginal groups and Industry partners), participate in the development and implementation of initiatives established to detect, monitor and adaptively manage cumulative effects on fish habitat in the lower Athabasca River watershed. Should the monitoring indicate that there are additional adverse effects on fish habitat resources in the lower Athabasca River watershed not already considered, and demonstrated to be caused by the project, TOTAL shall mitigate or, if necessary, reasonably compensate for the losses.

EC

47. TOTAL will continue to be actively involved in and support the Alberta Biodiversity Monitoring Institute and the Regional Terrestrial Monitoring Program for the Lower Athabasca Region.

48. To minimize impacts to breeding migratory birds, TOTAL will avoid habitat destruction (i.e. vegetation clearing, flooding) during breeding bird period.

49. TOTAL will include accepted industry standard bird deterrent technology in the project design and employ ongoing adaptive management to optimize the efficacy of bird deterrents. TOTAL will participate in the Oil Sands Wildlife Protection Committee, which facilitates an ongoing process to evaluate the efficiency of these systems. TOTAL will participate in the bird deterrent monitoring program currently being developed by provincial regulators. TOTAL will adopt a deployment date that ensures that the systems are available when migratory birds start arriving in the area.

50. TOTAL will monitor results of the Boreal Avian Modelling Project.

51. TOTAL will participate in the development of the Lower Athabasca Regional Plan Biodiversity Management Framework, if given the opportunity to do so.

52. TOTAL will identify opportunities for onsite pilot studies for peat-accumulating wetlands establishment on lower topographic positions in the closure landscape on the project site.

53. TOTAL will ensure that the operational mine haul fleet is US EPA Tier IV compliant.

54. TOTAL will meet the CCME National Emission Guideline for Commercial Industrial Boilers and Heaters (1998).

55. TOTAL will participate in the Wood Buffalo Environmental Association (WBEA) and TOTAL will contribute to additional monitoring within the WBEA air quality monitoring network for emissions associated with the project.

56. TOTAL will participate in the Regional Aquatics Monitoring Program (RAMP). RAMP data are expected to be available to the public by the end of 2010.

57. TOTAL will work with DFO regarding the public availability of data relating to the project specific monitoring for the Joslyn Creek re-alignment and compensation lake.

58. TOTAL will continue to actively participate in the CEMA End Pit Lake Committee and will gather information from monitoring conducted at other operational pit lakes, once this becomes available, and that data will be considered.

59. TOTAL will monitor water quality in the pit lake once the pit lake begins filling to evaluate whether the water meets the prescribed discharge criteria. Release of pit lake water will commence only when appropriate discharge conditions are met.

60. TOTAL will develop and implement a comprehensive groundwater monitoring and management plan. TOTAL will support the Alberta Groundwater Initiative and will follow the requirements set out in the Groundwater Management Framework for the Northern Athabasca Oil Sands Region. TOTAL will work with AENV regarding the public availability of regional groundwater data.

61. TOTAL will continue to actively participate in the CONRAD Environmental and Reclamation Research Group (ERRG) and CEMA Reclamation Working Group and ensure that ally lessons learned and results of these studies are incorporated in the project plans.

62. TOTAL will develop comprehensive emergency response plans in consultation with relevant stakeholders that identify, describe and evaluate the potential impact of ail project-related accidents and malfunctions; and identify a set of procedures to ensure a prompt response, notification and clean-up in the event of a hazardous substance spill or threat of re lease. TOTAL will provide a copy of the plan to relevant stakeholders and any other interested parties, such as EC.

63. TOTAL will conduct surveys for western (boreal) toads, including the use of ocular survey techniques on ponds during the breeding season. In the event that large local populations are detected in areas in which dewatering or land clearing activities are planned, TOTAL will undertake translocation.

Health Canada

64. TOTAL will consider in the emergency response plan events that could adversely affect the quality of the Ells River. The plan will include instructions to communicate immediately with groups and individuals that could be impacted by an event affecting the water quality of the Ells River, such as drinking water treatment facilities, any work camps, and residents whose drinking water comes from a source other than a drinking water treatment facility.

APPENDIX 6 – RULING ON PRELIMINARY MATTERS

September 22, 2010

TO:TOTAL E&P Joslyn Ltd. and Parties Participating in the Proceeding

RE:Joslyn North Mine Project
TOTAL E&P Joslyn Ltd. (TOTAL)
CEAR Reference No. 08-05-37519
ERCB Application No. 1445535

On Tuesday, September 21, 2010 the Joint Review Panel (Panel) adjourned the hearing to consider the following preliminary matters:

1. the questions of constitutional law raised by the Mikisew Cree First Nation (MCFN), including whether the Court of Queen's Bench would be the more appropriate forum to decide the questions;
2. the motion by TOTAL for a ruling that the MCFN be required to provide better responses to information requests made by TOTAL to the MCFN. The information requests relate to material filed in this proceeding by the MCFN, specifically reports and a slide presentation that Dr. David Schindler will address as a MCFN witness; and
3. the motion by the Oils Sands Environmental Coalition (OSEC) requesting that the Panel or TOTAL obtain additional information on, and analysis of the cumulative effects of the Joslyn North Mine Project. The motion also requests that the Panel adjourn the hearing until the information and analysis is completed and parties have had sufficient time to evaluate the information.

On September 22, 2010, the Panel received a letter from counsel for the MCFN advising that the MCFN had reached an agreement with TOTAL and was withdrawing its objection to the Joslyn North Mine Project as well as its Notice of Questions of Constitutional Law.

On September 21, 2010 at the opening of the hearing, the Athabasca Chipewyan First Nation and the Fort MacKay First Nation also withdrew their objections to the application. As a result, no questions of constitutional law remain in this proceeding and the Panel does not need to consider further the issues arising from item 1 above.

On September 22, 2010, counsel for TOTAL advised the Panel that it did not require a ruling on item 2 above, provided that Dr. Schindler does not give evidence in this proceeding. TOTAL stated it reserved the right to revive the motion if Dr. Schindler should appear on his own behalf or as a witness for any other party to the proceeding. The Panel has decided that TOTAL's position is acceptable and therefore will not rule on the TOTAL motion, but TOTAL may revive its motion if Dr. Schindler appears as a witness in this proceeding.

DECISION ON OSEC MOTION (Item 3)

The Panel is mindful of its duty to ensure that the information required for the assessment it is conducting in this proceeding is obtained and made available to the public. The OSEC motion identifies certain information which OSEC states the Panel must obtain in order to discharge that duty. To summarize OSEC's position, it identifies the following as additional information that is needed by the Panel:

- a cumulative effects assessment that incorporates the Terrestrial Effects Management Framework (TEMF) developed by the Cumulative Effects Management Association (CEMA);
- an assessment of the potential effects of forest fires;
- a reasonable estimate of the future forestry activity and an assessment of its effects; and
- likely future projects, namely the Equinox and Frontier Mines, and an assessment of their potential effects.

In response to the OSEC motion, counsel for TOTAL described the information requests and responses on these matters that were exchanged between TOTAL and OSEC. He expressed concern that OSEC had engaged TOTAL in an information request process on these issues but that OSEC chose to file its motion the day before the hearing, and asked the Panel to dismiss the motion on that basis alone. With respect to the projects identified in the OSEC motion, counsel for TOTAL stated that the Frontier and Equinox projects were not considered by TOTAL for inclusion in its cumulative effects assessment because the projects were not significantly certain to warrant inclusion. He stated that the projects were only in the preliminary and conceptual stages and no meaningful information about the certainty or nature of the projects existed. The Panel has decided that OSEC has not demonstrated in its motion that these two projects are sufficiently "likely" or reasonably foreseeable so as to require TOTAL to incorporate cumulative environmental effects from those projects into its cumulative effects assessment. OSEC will, however, be entitled to pursue this issue in the hearing.

In response to OSEC's position that TOTAL failed to consider the effects of forest fires and forestry activity, counsel for TOTAL stated that TOTAL's witnesses would address those matters in their opening statement. The Panel has decided not to grant OSEC's motion on this ground, given TOTAL's statement that it will address the issues in its evidence. The Panel does, however, direct TOTAL to provide a "will say" statement that reflects the evidence in chief that TOTAL's witnesses will give on these points.

In response to OSEC's submissions regarding the TEMF, counsel for TOTAL indicated that TOTAL's witness panel would be in a position to answer questions from parties about the cumulative effects assessment it conducted, and that the hearing was the proper venue in which to explore the issue. The Panel agrees with TOTAL that the adequacy of TOTAL's cumulative effects assessment, and whether the Panel has all the information needed to conduct its assessment, are questions matters to be explored in the hearing as the evidence on those matters is obtained. The Panel has therefore decided not to grant OSEC's motion on this point. However, the Panel directs TOTAL to provide a "will say" statement that reflects the evidence in chief that TOTAL's witnesses will give on this point.

As a result, the motion made by OSEC is denied by the Panel, but the Panel directs TOTAL to provide the "will say" statements indicated above. The "will say" statements must be provided to OSEC and the Panel on or before 4:00 pm on Friday, September 24, 2010.

The Panel has also decided that the hearing for the Joslyn North Mine Project will resume in Fort McMurray at 9:00 am, on Tuesday, September 28, 2010.

If you have any questions in relation to this letter or the Panel's directions, please feel free to contact me.

Yours truly,

Gary Perkins
Legal Counsel for the Joint Review Panel

cc: Addressees of the NQCLs
Brett Maracle, Crown Consultation Coordinator

APPENDIX 7 RECOMMENDATIONS MADE BY ABORIGINAL GROUPS DURING CLOSING ARGUMENTS[47]

Mikisew Cree First Nation recommended

- that Canada establish a comprehensive and transparent monitoring program for water flows and water quality for the Lower Athabasca River Basin, including monitoring of tailings reclamation and tailings seepage. The program should include as an essential element public oversight by a committee of independent experts and aboriginal representatives, including the Mikisew.
- that Canada and Alberta take the necessary steps to regionalize the regulation of certain aspects of the oil sands such as reclamation, tailings reduction, and water use. Focus should be placed on utilizing the highest standards, the best technology, regardless of proprietary interests, and the conservation of resources.
- that Alberta finalize a wetland policy that includes compensation for destroyed or altered wetlands.
- that the Athabasca River be designated as a Heritage River.
- that governments alter water permits to existing mines so as to lower and cap the peak water withdrawal that will be needed by the oil sands industry from the lower Athabasca River.
- that Alberta and Canada immediately implement a precautionary base flow of the Athabasca River of 100 cubic metres per second. No withdrawals below this flow should be allowed.
- the establishment of a precautionary aboriginal base flow for the Athabasca River at 1600 cubic metres per second, and a precautionary aboriginal extreme flow at a level of 400 cubic metres per second during the months that the river is used for travel.
- that Canada and Alberta include tributaries in their calculations of in-stream flow needs as they finalize the Lower Athabasca Management Framework in Phase 2.
- that Canada and Alberta expand the testing parameters of drinking water at Fort Chipewyan to include PAHs and toxic metals using methodology capable of measuring at thresholds relevant to human health.
- that Canada actively assume a stronger federal role in protecting fresh water in the oil sands through monitoring the release of toxic substances and the impacts of such substances on such fisheries and through a stronger enforcement presence.
- that Canada and Alberta develop a single public registry, perhaps a website, for the region that provides information on water licences, *Environmental Protection and Enhancement Act* approvals, ERCB decision reports, oilsands leases, compliance and monitoring, relevant environmental data. Access to the registry should be open and free.

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[47] Extracted from the Transcripts, Volume 9.

- that Wood Buffalo National Park be included in any impact study in respect of oil sands activity.
- that monitoring be conducted by the federal government through a program overseen by a committee of independent experts and aboriginal representatives, including the Mikisew.
- that Canada and Alberta acknowledge the First Nations exercise of Treaty rights as a priority land use in their traditional territories and cause that priority to be reflected in land use and resource development policies such as LARP.
- the establishment of First Nations-specific land use conservation areas with viable corridors that are managed jointly with First Nations and Alberta.
- that resources be provided to First Nations to conduct a regional cumulative effects assessment which includes comprehensive traditional land use and traditional ecological knowledge with the aim of developing a traditional resource use plan. That resource use plan would be a key focus in other policies such as LARP.
- to Canada and Alberta that a terrestrial "No Net Loss" standard be utilized when considering disturbance approvals.
- to Canada and/or Alberta the establishment of predisturbance baseline information, including the range of natural variation for wildlife populations before disturbance of any further industrial activity.
- that Canada accelerate the development of recovery plans for Wood Bison and Woodland Caribou identifying critical habitat which must be protected under the *Species at Risk Act*.
- to Canada and Alberta that they set as a reclamation standard the restoration of wetlands, particularly bogs and fens.
- that Canada conducts with them a traditional food study to examine the impact of oil sands contaminants on traditional foods, such as: fish, moose, caribou, small game, bird eggs, and berries in the region. Special attention should be drawn to the location of traditional foods in relation to oil sands mine development.
- that Alberta finalize the Oil Sands Mine Liabilities Management Program with input from Mikisew.
- to Alberta and Canada that a comprehensive Baseline Health Study for Fort Chipewyan residents be conducted as recommended in the 2003 EUB Decision Report. In addition, a study of contaminant intake and body burden of members of Fort Chipewyan should be undertaken.
- to Canada that it develops a comprehensive sustainable employment strategy with the Mikisew to address employment and training issues in the region.
- that Canada and Alberta require a proponent delegated consultation to be complete before an application can proceed to the completeness test.

- that impact benefit agreements be a pre-condition of regulatory approval.
- that Canada and Alberta ensure the Mikisew has adequate capacity for meaningful consultation on all resource development activities that may impact their traditional lands.
- that Canada and Alberta resource additional First Nations-directed analysis related to health, diet, practice of treaty and aboriginal rights and avoidance patterns related to contaminants.

Fort McKay First Nation and the Métis Nation Local #63 recommended

- that Canada and Alberta agree to negotiate, in good faith, measures to accommodate the cumulative effects of oil sands development on Fort McKay's treaty and aboriginal rights, on their interests, which include the well-being and future of its community. To implement this recommendation, Fort McKay recommended to the Minister of Indian Affairs and Northern Development that a senior official be appointed to oversee this consultation and accommodation and develop this agreement with Fort McKay.
- that the Alberta Cabinet appoint a senior official reporting directly to the President of the Treasury Board to participate in this consultation and accommodation impact offset negotiations.
- that a regional odour study be designed and implemented by Environment Canada or Alberta Canada, in consultation with Fort McKay.
- that regulators support and assist Fort McKay through the provision of technical guidance facilitating discussions with oil sands developers.
- that Alberta and Canada work with Fort McKay to develop and fund a community-controlled water and terrestrial resources, including wildlife, health assessment, and monitoring.

Athabasca Chipewyan First Nation recommended

- that any approval or recommendation that the project proceed include recommendations to Canada and Alberta to consult with ACFN prior to the issuance of further decisions on oil sands projects
- that Alberta and Canada provide capacity funding so that ACFN may participate meaningfully in consultation about the impact of industrial development on their lands, rights and culture.
- Canada and Alberta work with them to complete and implement a treaty rights assessment and traditional resource use plan as per the outline attached as Appendix 9 to its written submissions.
- that the government adhere to the thresholds and limits identified in a completed treaty rights assessment and traditional resource use plan in subsequent regulatory processes conducted by and decisions of the ERCB or future joint review panel.
- the adoption and implementation of an aboriginal base flow as set out in ACFN and MCFN's "Review of the Phase 2 Framework Committee Recommendations",

- the assessment of effects of current and reasonably foreseeable development on the Delta and implementation of an independent and scientifically rigorous monitoring program for the Delta in consultation with affected First Nations to address that issue.

- the implementation, through consultation with ACFN, of independent and scientifically rigorous regional monitoring programs to monitor the quality and quantity of water in the river, including between Fort McMurray and Old Fort and to monitor the cumulative impacts of regional development upon human health. ACFN asked that the government commit to substantially address any problems that come to its attention as a result of the monitoring.

- that capacity funding be provided and other support so that ACFN can participate in processes regarding the upgrade of the Fort Chipewyan community water treatment facility and the relocation of the intake pipe.

- the protection, including an assessment of the health of individual animals, for bison and woodland caribou in the Traditional Lands from further declines due to industrial development.

APPENDIX 8 - LANDSCAPE DESIGN CHECKLIST

The *Landscape Design Checklist* was approved in 2005 by the Government of Alberta. TOTAL referenced the checklist in its application and used portions of it in its planning process but did not provide the document. The checklist is a concise and comprehensive checklist of design objectives for creation (design, construction, reclamation, and maintenance) of landforms and landscapes in the Athabasca oil sands region.

The landscape designer (or evaluator) shall address the following design issues so that landscape performance will sustain proposed end land uses and equivalent capability.

Design Items	Action
Planning	
1. Regulations, agreements, and corporate objectives	1.1 Prepare a list of all specific applicable regulations and agreements that are being considered in design. 1.2 Prepare a list of all specific corporate objectives 1.3 Design landscape to clearly meet these objectives
2. Technology selection	2.1 Select technologies that produce materials that can be reclaimed to desired end land use. 2.2 All competing technologies must be evaluated using formal screening processes that consider life-cycle economics and environmental impacts.
3. Footprint – size/location	3.1Design footprint considering all relevant issues. 3.2 Resolve and document lease boundary issues with adjacent users. 3.3 Resolve and document issues about mining up to or through rivers, lakes, wetland, and other natural features. 3.4 Integrate footprint with closure landscape commitments and plans.
4. Mass balances	4.1 Design to accommodate material balances. 4.2 Plans and schedules shall meet operational and long-term goals and include the transition (and retrofitting) from an operational landform to a reclamation landform.
5. Preservation of by-product resources	5.1 Store any by-product that is considered a potential future resource, in such a way that it can be recovered in a manner acceptable to the EUB, AENV, SRD, and post-recovery landscape has the capability to meet environmental and end land use goals. 5.2 Design and manage by-product landforms to reduce potential for combustion triggered by internal (spontaneous combustion) or external sources (lightning, wildfire).
6. Design for operations	6.1 Choose suites of technologies that support the ongoing operation (e.g. acceptable recycle water quality). 6.2 Design and schedule reclamation and closure activities to allow continuing oil sands operations. 6.3 Avoid compromising operational safety to satisfy closure goals. 6.4 Design to promote timely and progressive reclamation.
7. Design for closure	7.1 Design landforms to be consistent with approved closure plan including surrounding lands 7.2 Plan all phases of construction and reclamation to achieve closure landform. 7.3 Plan and schedule decommissioning of facilities, inventories of process-affected water, by-products and wastes. 7.4 Integrate any long-term infrastructure with reclamation plans and landscape designs.

Design Items	Action
	7.5 Design infrastructure with a consideration of its future decommissioning and reclamation.
8. Closure management (pre- certification)	8.1 Design to avoid or minimize the need for post operational maintenance, design for stable, self-sustaining landforms and to prevent re-disturbance of previously reclaimed lands. 8.2 Identify areas requiring or at risk of needing post-operational monitoring and mitigation. 8.3 Develop a monitoring and mitigation program for the period during and after construction and reclamation and until the landform is considered stable and suitable for reclamation certification. 8.4 Give explicit consideration to monitoring and mitigation requirements, where there may be a potential for extreme events and impacts of targeted end land use. 8.5 Develop conceptual plan for potential mitigation activities.
9. Post Certification	9.1 Design recognizing that no post certification maintenance is envisioned under the Environmental Protection and Enhancement Act and Public Lands Act.
Desired Characteristics/Goals	
10. End Land Use	10.1 Design with human and wildlife health and safety as the highest priority. 10.2 Design landscape to meet goals for targeted land uses including access and meeting equivalent capability targets on the whole lease.
11. Soils	11.1 Design and construct landform morphology and substrate to support replaced soil quality and to protect soils from loss and degradation. 11.2 Design reclamation material layers to achieve target soil capability.
12. Vegetation	12.1 Design topographic features, soils and substrate to support vegetation to achieve end land uses. 12.2 Create a vegetation plan that meets intended land uses on a lease- wide basis. 12.3 Create a vegetation plan that meets intended land uses for landform. 12.4 Design vegetation plan to aid landform stability (erosion, water table, moisture).
13. Wildlife	13.1 Incorporate wildlife habitat and movement into design of landform and landscape scales. 13.2 Provide spatial attributes appropriate for wildlife and aquatic habitat goals.
14. Aquatics	14.1 Design drainage patterns, watercourses and waterbodies to be an appropriate combination of biological zones. 14.2 Avoid pond / lake evapoconcentration that leads to unproductive water bodies. 14.3 Indicate any water treatment wetlands that may be exempt from some aquatic ecology and influent water quality considerations.
15 Geotechnical slope stability	15.1 Design to protect slopes from instability. 15.2 Design to protect downstream areas from effects of catastrophic release of mobile materials. 15.3 Design to allow only acceptable consequences of potential flowslides.
16. Trafficability/bearing capacity	16.1 Plan construction techniques to enhance trafficability for reclamation. 16.2 Design trafficability and bearing capacity to be compatible with end land use.
17. Natural appearance	17.1 Design topography to resemble natural landforms in the region.
18. Seepage and groundwater (quality and quantity)	18.1 Design to protect groundwater from impacts that affect offsite and/or on-site end land use. 18.2 Evaluate reclamation water balance at all critical scales. 18.3 Avoid reliance on seepage controls that require long-term maintenance.

Design Items	Action
	18.4 Evaluate landscape performance (geotechnical, soils, etc) for long-term seepage conditions.
19. Surface water hydrology (quantity and quality)	19.1 Design an integrated landform, landscape and regional drainage system. 19.2 Design watercourses and waterbodies to have physical capacity to accommodate all ranges of hydrologic processes at acceptable rates of erosion. 19.3 Integrate operational and closure water balances to reduce inventory of process-affected water at closure.
Processes	
20. Natural hazards and disturbing forces	20.1 Design landscapes to be acceptably stable under target end land uses. 20.2 Design landscapes to be acceptably stable under a variety of natural hazards and extreme events including fire, floods, drought, extreme precipitation, blight and disease, wind, earthquakes, animal effects.
21. Erosion, transport, and sedimentation	21.1 Design operational wind and water erosion control measures where needed. 21.2 Design to accommodate all forms of erosion of (or depositing onto) landforms including lakes and major drainages at acceptable rates.
22. Settlement of fills	22.1 Design long-term properties and topography to accommodate settlement and control any undesirable ponding. 22.2 Design surface water drainage system to accommodate settlement, including long-term saturation settlements and settlement of soft tailings.

APPENDIX 9 – HEARING PARTICIPANTS

Principals and Representatives (Abbreviations used in report)	Witnesses
TOTAL E&P Joslyn Ltd. (TOTAL) M. Ignasiak R. Miller K. Slipp G. Chow	G. Houston, P.Eng. A. Mittler M. Haig W. Brown J. Gulley, P.Biol. R. Eccles, P.Biol. D. Long, Ph.D., P.Eng. B. Koppe, P.Biol. M. Ingen-Housz
BP Canada Energy Company C. Browning	
Shell Canada Ltd. (Shell) D. Kolenick	
Syncrude Canada Ltd. K. Shannon	
F. Belanger Member of the Dene Sioux First Nation	
Regional Municipality of Wood Buffalo (RMWB) R. Purdy T. Marriott	Mayor M. Blake M. Evans H. Kuehne G. Gordon W. Holodniuk E. Hutton
H. Scannie	
N. Scannie	
Oil Sands Environmental Coalition (OSEC) R. Secord K. Buss W. Randall	J. Hansen, Ph.D. S. Dyer N. Lemphers M. Huot M. Kitagawa
Sierra Club Prairie S. Hazell	P. Cizek S. Hazell W. Donahue, Ph.D., LL.B.
Mikisew Cree First Nation (MCFN) D. Mallon, Q.C. E. Chipiuk R. Janes K. Brooks	

Principals and Representatives (Abbreviations used in report)	Witnesses
Fort McKay First Nation and Métis Nation Local #63 (Fort McKay)	
K. Buss	
R. Secord	
Athabasca Chipewyan First Nation (ACFN)	
S. Nixon	
J. Nelson	
J. Biem	
Non-Status Fort McMurray Band Descendants, and	J. Malcolm
Off-Reserve Fort McMurray Band Descendants	G. Cardinal
J. Malcolm	K. Moore
	C. Malcolm
M. Guertin	
L. Courtoreille	
Clearwater River Band No. 175	M. Powder

Principals and Representatives (Abbreviations used in report)	Witnesses
Government of Canada K. Lambrecht R. Drummond J. Alfred	Fisheries and Oceans Canada (DFO) B. Makowecki M. Janowicz C. Berryman
	Environment Canada (EC) S. Forbrich D. Fox C. Watt S. Song, Ph.D. D.C. Duncan, Ph.D. R. Bloom W. Booty, Ph.D. Z. Wang, Ph.D. C. Brown, Ph.D. D. Donald G. Bickerton, P.Eng. A. Talbot, Ph.D.
	Health Canada (HC) L. Pelletier T. Nakamura D. Muddle A.K. Mohapatra
	Natural Resources Canada (NRCan) S. Ball, Ph.D. S. Liao R. Mikula, Ph.D.
	Parks Canada Agency S. Macmillan J. Shatford D. Kirkland
Government of Alberta J. Mallet S. Lopetinsky	

Principals and Representatives (Abbreviations used in report)	Witnesses
Joint Review Panel (Panel) staff G. Perkins, Panel Counsel M. LaCasse, Panel Counsel C. Birchall, Panel Counsel J. Adams P. Aguas, P.Eng. T. Al-Zabet, Ph.D., P.Geol. C. Crull J. Dyble L. Grilo, P.Eng. D. Haddon C. Hale, RPFT. P. Harrison, P.Eng. L. Jamault M. Mann, P.Eng. H. Mian, Ph.D., P.Eng. T. Neufeld G. Onovwiona, P.Eng. D. Sheremata C. Tamblyn M.-F. Therrien D. Vroom	